EPA WORK ASSIGNMENT NO: 076-2JZZ
EPA CONTRACT NO: 68-W8-0110
FOSTER WHEELER ENVIRONMENTAL CORPORATION
ARCS II PROGRAM

FINAL
SITE INSPECTION PRIORITIZATION (SIP)
LAKEWOOD TOWNSHIP LANDFILL SITE
LAKEWOOD TOWNSHIP
OCEAN COUNTY, NEW JERSEY
CERCLIS NO. NJD980771711

JANUARY 1996

VOLUME I OF IV

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FOSTER WHEELER ENVIRONMENTAL CORPORATION

January 17, 1996
ARCS/95-076-1464

Ms. Catherine Moyik
Work Assignment Manager
US Environmental Protection Agency
18th Floor
290 Broadway
New York, NY 10007

SUBJECT: ARCS II PROGRAM - EPA CONTRACT NO. 68-W8-0110
WORK ASSIGNMENT NO. 076-2JZZ
SITE INSPECTION PRIORITIZATION (SIP) REPORT
LAKEWOOD TOWNSHIP LANDFILL SITE

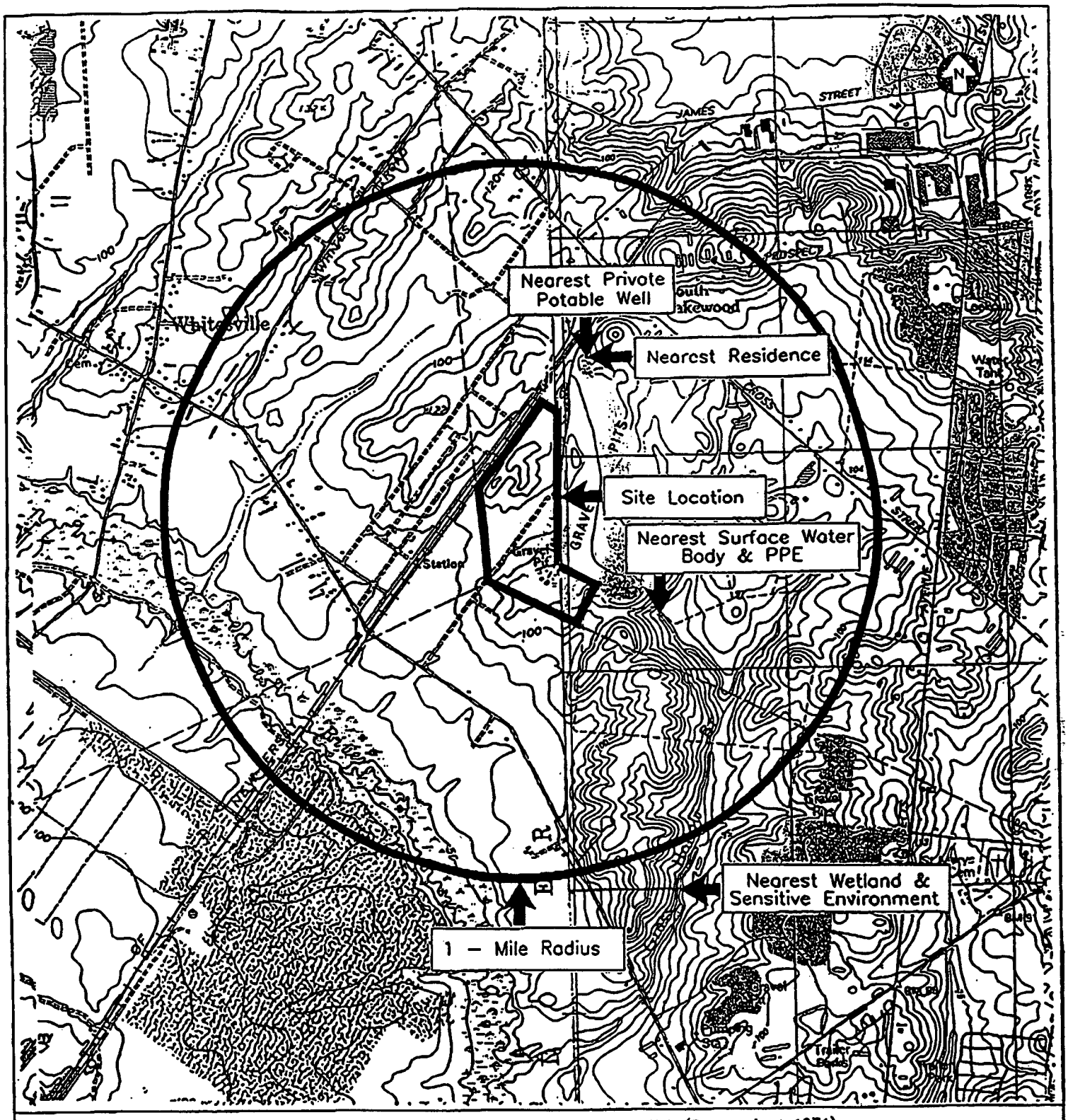
Dear Ms. Moyik:

The following is a summary of the Site Inspection Prioritization (SIP) evaluation of the Lakewood Township Landfill site, CERCLIS No. NJD980771711, located in Lakewood Township, Ocean County, New Jersey.

General Description and Site History

The Lakewood Township Landfill site is an inactive, municipally owned/operated sanitary landfill (Ref. 7, p. 16 of 98). The site is located approximately 1/4 mile southwest of the intersection of Cross and Prospect Streets and adjacent to and south of the railroad tracks owned by Central Railroad (C.R.R.) of New Jersey in Lakewood Township, Ocean County, New Jersey (Ref. 7, pp. 14 and 15 of 98). The landfill is bordered to the north by Cross Street, to the east by Massachusetts Avenue, to the south by Whitesville Avenue, and to the west by Faraday Avenue and a branch of C.R.R. of New Jersey (Ref. 7, pp. 14 and 15 of 98). A paved access roadway extends from the northern end of the site to Cross Street (Ref. 13, p. 11 of 20; Ref. 31, p. 1 of 1). The Lakewood Township Landfill accepted waste from 1973 through 1982 and was closed in March 1984 (Ref. 3, p. 25 of 27; Ref. 13, p. 7 of 20). The landfill property encompasses 62 acres and is located on Block 524, Lots 102, 103, 104 and parts of 101 and 105 (Ref. 7, p. 16 of 98). The landfilled area consists of two waste cells (eastern waste cell and western waste cell), each approximately 14 acres in plan area (Ref. 13, p. 7 of 20). Figure 1 presents the site location and the Figure 2 presents the site layout map.

8 PEACH TREE HILL ROAD, LIVINGSTON, NJ 07039
TEL: 201-597-7000 FAX: 201-597-7025



Source: U.S.G.S. 7.5 Minute Series Topographic Maps Quadrangles, Lakehurst,N.J. (Photorevised 1971), Lakewood, N.J. (1979), Toms River, N.J. (1989) & Keswick Grove, N.J. (1957, Photorevised 1975)

SITE LOCATION MAP

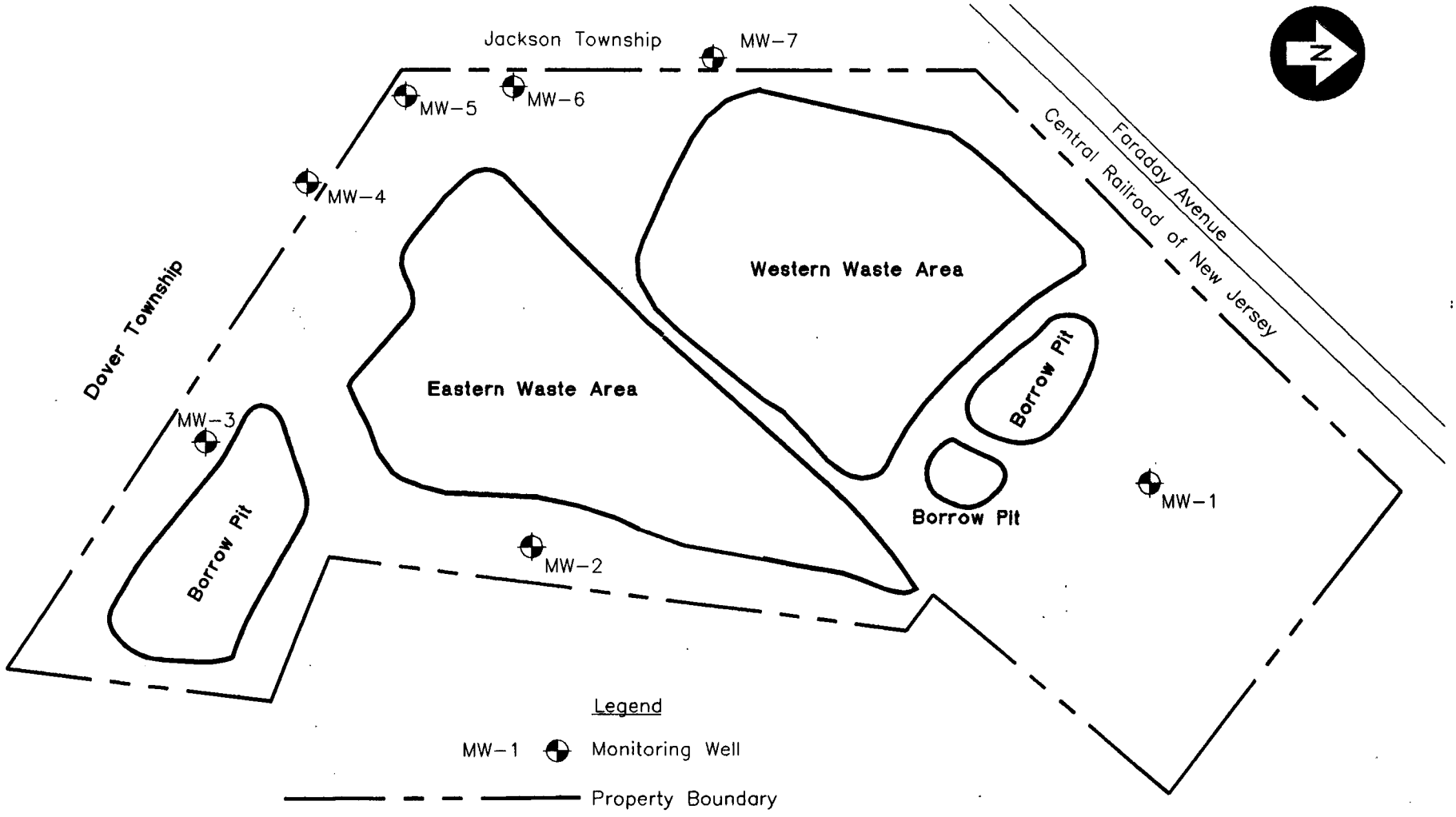
Lakewood Twp. Landfill Site
Lakewood Twp., Ocean County, N.J.

EBASCO SERVICES, INC.

SCALE 1:24000

0 1 MILE

FIGURE 1



Source: Stanley Peters Associates, Lakewood, N.J.
Lakewood Landfill, Topography & Survey Plan of Blocks 515 - 523 & P.O. Blk. 524, Tax Map Sheets 99 & 100, Lakewood Twp., Ocean County, N.J.

Scale: 1 inch = 350 feet

SITE LAYOUT MAP

Lakewood Twp. Landfill Site
Lakewood, N.J.

EBASCO SERVICES, INC.

FIGURE 2

Prior to the commencement of the landfill operations, the site was utilized as a sand and gravel borrow area (Ref. 13, p. 12 of 20). The area surrounding the landfill to the north, south and west are relatively flat to gently rolling (Ref. 31, p. 1 of 1). The topography east of the site is variable due to previous sand and gravel mining operations (Ref. 31, p. 1 of 1). Within the site limits, the waste cells and the drainage basins (former borrow area) provide an approximate 45 foot relief in topography (Ref. 13, p. 12 of 20). The maximum side slope of the waste cells and drainage basins is 3 horizontal to 1 vertical (Ref. 13, p. 12 of 20).

The landfill became operational prior to implementation of the current regulations and, consequently, has no bottom liner (Ref. 13, p. 5 of 20). The landfill accepted municipal waste (residential, commercial, and institutional), bulky waste, construction and demolition waste, sewage sludge (solid and liquid), and non-hazardous chemical waste liquids (Ref. 13, pp. 7 and 8 of 20). A total of 3,715,360 gallons of liquid sewage sludge were accepted at the landfill during 1975, 1976, 1977 and 1980 (Ref 7, p. 17 of 98). Based on the NJDEP investigative reports dated February 7, 1977 and March 1, 1977, a total of 4,240,000 gallons of non-hazardous waste liquids generated by Fluid Packaging (a/k/a Fluid Chemical) were disposed of in the eastern cell of the landfill during 1976 and 1977 (Ref. 7, p. 17 of 98; Ref. 16, p. 1 of 5; Ref. 17, pp. 1 through 7 of 7). The liquid chemical waste was thought to be cleaning solvents; however, no additional documentation was available (Ref. 16, p. 1 of 5).

On August 15, 1980, NJDEP issued an Administrative Order (AO) authorizing the landfill to continue to accept and dispose of liquid sewage and sewage sludge until March 15, 1981 (Ref. 27, pp. 17 and 18 of 18). On July 31, 1980, the NJDEP issued a Certification of Approval of the County Solid Waste Management Plan which provided for the closure of the Lakewood Township Landfill (Ref. 27, pp. 3, 4 and 5 of 18). NJDEP issued an AO on June 10, 1981 for failing to maintain the grade and thickness of fill surfaces and to limit the width of the working face to less than the maximum of 150' in compliance with the solid waste management regulations (Ref. 27, pp. 1 and 2 of 18). NJDEP issued an Administrative Consent Order (ACO) on October 14, 1981 to Lakewood Township which required the Township to submit a closure plan for the landfill and cease acceptance of all wastes at the landfill (Ref. 27, pp. 3, 4 and 5 of 18).

On October 29, 1981 and January 26, 1982, the NJDEP issued an AO to Lakewood Township for failing to place a soil cover over the filled area of the landfill and for operating more than one working face at any one time and disposal of solid waste (Ref. 27, pp. 6 and 7 of 18). The NJDEP issued Notices of Prosecution to Lakewood Township on February 4, 1982, February 11, 1982, February 18, 1982 and March 17, 1982 for violations that occurred at the landfill during 1981 and 1982 (Ref. 27, pp. 8 through 16 of 18).

A Preliminary Assessment (PA) of the landfill was performed by Malcolm Pirnie, Inc. on March 20, 1985 (Ref. 3, p. 1 of 27). The PA report indicated groundwater contamination from leachate and noted an incident in which a welding type tank exploded (Ref. 3, p. 5 of 27). The PA report indicated the presence of drums during two site visits and inadequate cover material placement on filled areas (Ref. 3, p. 6 of 27). The report also noted issuance of ACOs during 1981 and 1983 requiring the landfill to cease accepting waste for disposal (Ref. 3, p. 6 of 27).

As per the Site Inspection Report dated June 26, 1985, leachate seeps were observed in several areas of the landfill during an inspection by the NJDEP on June 18, 1985 (Ref. 20, p. 3 of 12). The report also noted that the landfill was capped with clay; this is inconsistent with the French and Parrello Associates report that states that the landfill cover consists of clean, coarse to fine sand overlain by sandy topsoil (Ref. 13, p. 16 of 20; Ref. 20, p. 3 of 12). The Ebasco site investigation also described the landfill's soil cap as sand (Ref. 6, p. 3 of 8). The report referenced a groundwater permit (No. 0055166) dated June 1, 1985 that was issued by the NJDEP (Ref. 20, p. 3 of 12). No samples were collected during the inspection (Ref. 20, pp. 1 through 12 of 12).

The NJDEP memo dated July 9, 1985 indicated that construction type wastes were allowed to be dumped at the landfill to bring the site up to grade (Ref. 21, p. 1 of 2). Another NJDEP memo dated July 9, 1985 confirmed disposal of over 4 million gallons of liquid chemical wastes into the landfill by Fluid Packaging (a/k/a Fluid Chemical) (Ref. 16, p. 1 of 5).

On October 17, 1985, NJDEP conducted sampling at the Lakewood Township Landfill (Ref. 18, p. 1 of 33). Two on-site monitoring wells, one off-site potable well, two leachate seeps and five soil samples were collected for analysis (Ref. 18, pp. 25 and 26 of 33). One monitoring well exhibited chlorobenzene (140 ug/L) (Ref. 18, p. 6 of 33). A leachate seep sample exhibited toluene (35 ug/L), ethylbenzene (11 ug/L), diethyl phthalate (40 ug/L), and bis (2-ethylhexyl) phthalate (39 ug/L) (Ref. 18, pp. 7 and 15 of 33). One of the soil samples exhibited diethyl phthalate (.43 mg/kg), butylbenzyl phthalate (1.7 mg/kg), dioctyl phthalate (1.6 mg/kg), benzo (k) fluoranthene (1.0 mg/kg) and endosulfan I (.23 ug/kg) (Ref. 18, pp. 6 through 23 of 33). The potable well showed no contamination (Ref. 18, pp. 6 through 23 of 33). An inspection memo dated November 21, 1985 noted leachate seeps flowing into low areas creating large puddles (Ref. 18, pp. 29 and 30 of 33). Even though the landfill was officially closed, disposal of construction debris continued (Ref. 18, pp. 29 and 30 of 33).

The NJDEP memo dated February 26, 1986 indicated that the Lakewood Municipality had not complied with the NJPDES permit and a subsequent noncompliance letter requiring installation of monitoring wells (Ref. 24, p. 1 of 1). This memo also noted lack of cover over filled area and extremely foul odor from the landfill (Ref. 24, p. 1 of 1).

Documented vandalism and subsequent repair and replacement of monitoring wells at the site occurred during 1986 through 1989 (Ref. 25, pp. 1 through 14 of 14).

The NJDEP conducted a Compliance Evaluation Inspection of the landfill on March 28, 1989 and issued a letter dated April 11, 1989 rating the landfill facility "Unacceptable" due to damaged or unacceptable conditions of monitoring wells; lack of valid NJPDES permit and exceedances of lead (120 ug/L to 800 ug/L) and manganese (60 ug/L to 300 ug/L) in groundwater samples (Ref. 26, pp. 1 through 4 of 13).

The NJDEP issued a NJPDES permit (No. NJ0055166) for landfill leachate discharge to groundwater at the Lakewood Township Landfill (Ref. 28, pp. 1, 2 and 4 of 28). The permit required quarterly sampling and analysis of the existing seven monitoring wells to determine compliance with the groundwater protection standards specified in the permit (Ref. 28, pp. 1

through 28 of 28). The permit issuance and expiration dates are June 1, 1991 and June 30, 1996, respectively (Ref. 28, p. 4 of 28).

Groundwater samples collected by Lakewood Township from the seven monitoring wells in September and December 1992 revealed the presence of chlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, diethyl ether and tert-butyl alcohol in excess of three times the background well (MW-1) levels (Ref. 29, pp. 10, 13, 18, 21, 24, 27 and 32 of 85; Ref. 33, pp. 10. 14, 18, 21, 24, 30 and 34 of 105).

In March and December 1994, Lakewood Township collected additional groundwater samples from the seven monitoring wells (Ref. 34, pp. 1 through 20; Ref. 35, pp. 1 through 105). Analytical results indicated the presence of toluene, ethylbenzene, benzene, o-xylene, n- and p-xylene, chlorobenzene, 1,4-dichlorobenzene, diethyl ether in excess of three times the background well (MW-1) levels (Ref. 34, pp. 12 through 18 of 20; Ref. 35, pp. 10, 12, 18, 20, 24, 30 and 35 of 105).

Phase I of the closure of the Lakewood Township Landfill was performed from approximately October 1991 through May 1992 in order to prepare the landfill surface for the final cap and gas venting system installation (Ref. 13, p. 15 of 20). The Phase I closure activities included clearing, grading, stabilization, placement of 14 to 30 inches of soil cover, compaction, seeding and drainage system installation (Ref. 13, pp. 15 and 16 of 20). Lakewood Township is awaiting NJDEP approval of the Phase II Closure Plan submitted on May 24, 1994 (Ref. 13, p. 1 of 20). The Phase II Closure Plan includes construction of a final cap, gas venting system and storm water management system (Ref. 13, p. 7 of 20).

Ebasco conducted an on-site reconnaissance of the Lakewood Township Landfill on March 31, 1995 (Ref. 6. p. 1 of 8). The eastern and western waste cells were graded, covered with soil and vegetated as per the Phase I Closure Plan except for some of the western side slopes of the western waste cell (Ref. 6, p. 8 of 8). The erosion of soil and exposed municipal waste materials were observed on these side slopes (Ref. 6, p. 8 of 8). The only fence at the landfill site is at the dirt entrance road (Ref. 6, p. 5 of 8). There are natural barriers such as dense woods, raised railroad tracks and low areas (mined sand and gravel areas) (Ref. 6, p. 5 of 8). The drainage swales, two drainage basins (former borrow areas) and related piping system for collection and drainage of storm water from the landfill area were observed (Ref. 6, p. 8 of 8). Some of the inlets to the surface water collection system were found to be vandalized or damaged and some outlets to the surface water retention basins were filled with silt (Ref. 6, p. 8 of 8). All seven monitoring wells appeared to be in good condition (Ref. 6, p. 8 of 8). No odors were detected and no leachate seeps were observed at the landfill (Ref. 6, p. 8 of 8). The nearest residence, with three persons served by a 55' deep potable well, was located at approximately 1,300 feet north and hydraulically upgradient of the landfill (Ref. 6, p. 6 of 8, Ref. 28, p. 3 of 28 and Ref. 31, p. 1 of 1). Jackson Ultralights, which is located 500 feet southwest corner of the landfill at Faraday and Whitesville Roads, has a well that is used for general cleaning purposes (Ref. 6, p. 6 of 8; Ref. 31, p. 1 of 1).

Evaluation of Existing Data

Based on the available information the eastern and western landfill cells were identified as a source. Due to the lack of a liner underneath the landfill cells and the proximity of the surface streams to the landfill, the pathways of concern were determined to be the groundwater and surface water pathways. However, upon visual inspection of the landfill site, it was concluded that the surface water was unlikely to be affected due to the natural barriers and topography within the site. No odors were present at the site and the landfill cells were covered and vegetated, hence, the air migration of contaminants would be unlikely. A 14 to 30-inch soil cap was placed on the landfill as part of the Phase I closure activities; therefore, the soil exposure pathway was not considered significant.

The soil/leachate samples collected during the 1985 NJDEP SI were used to screen the landfill as a source even though the QA/QC documentation was not available. The 1992 and 1994 groundwater sampling events were also used to screen the landfill. The contaminants detected in the monitoring wells at concentrations three times the upgradient groundwater concentrations were assumed to be present in the landfill since there is no other potential source between the upgradient and downgradient wells.

Hazard Assessment

Updated and additional information and data were collected to further evaluate the site and to determine the need for further CERCLA remedial action. This information and data included groundwater data, private drinking well data, fishery information, 4-mile population data, flood plain information, wetland and sensitive environment information, geology and hydrology information, and site drainage patterns. The Ocean County Health Department was contacted and a search of their files was conducted (Ref. 37, p. 1 of 1).

Source Description

Based on available information, one source was identified at the Lakewood Township Landfill site. The source consists of the eastern and western landfill cells. The source area was estimated as 25.91 acres (1,128,640 square feet) (Ref. 30, pp. 1 through 14 of 14).

Contaminants detected in soil samples collected on October 17, 1985 indicated the presence of diethyl phthalate, butylbenzyl phthalate, dioctyl phthalate (di-n-octyl phthalate), benzo (k) fluoranthene, fluoranthene and endosulfan I at three times the background levels (Ref. 18, pp. 3 through 26 of 33). No background samples were collected; therefore, the sample with the least contamination was used to represent background conditions (Ref. 18, pp. 25 and 26 of 33).

The following contaminants detected in the on-site monitoring wells were used to evaluate the landfill since only limited soil sample data were available: benzene; toluene; 1,4-dichlorobenzene, chlorobenzene, diethyl ether (ethyl ether) (Ref. 29, pp. 1 through 85 of 85; Ref. 33, pp. 1 through 105 of 105; Ref. 35, pp. 1 through 105 of 105).

Groundwater Pathway

The groundwater pathway was evaluated using an observed release to groundwater of benzene, chlorobenzene, 1, 4-dichlorobenzene, diethyl ether, toluene, xylenes and chloroform. The aquifer of concern is the Kirkwood-Cohansey aquifer (Ref. 9, p. 12 of 12; Ref. 29, pp. 1 through 85 of 85; Ref. 33, pp. 1 through 105 of 105; Ref. 35, pp. 1 through 105 of 105). The aquifer is comprised of the Miocene aged Kirkwood Formation and the overlying Miocene aged Cohansey sand (Ref. 9, p. 7 of 12). The lithology of the Kirkwood Formation is characterized as fine to medium sand and silty sand and clay can be found at the basal portion of the formation (Ref. 9, p. 7 of 12). Cohansey sand is characterized as a light-colored quartz sand containing minor amounts of pebbly sand, fine to coarse-grained sand, silty and clayey sand and interbedded clay (Ref. 9, p. 7 of 12). The hydraulic conductivity of the Kirkwood-Cohansey aquifer is 1.0×10^{-3} cm/sec (Ref. 1, Table 3-6; Ref. 9, p. 7 of 12). Site-specific information on the depth to the bottom of the Kirkwood Formation from ground surface is not available. However, the NJ Water Company Lakewood #10 well (located northeast of the site in Lakewood Township) has a depth to the bottom of the Kirkwood Formation of 50 feet (Ref. 9, pp. 10 through 12 of 12). There is a confining layer below the Kirkwood Formation at this well which extends from 50 feet below ground to 500 feet below ground (Ref. 9, p. 12 of 12). The depth of the aquifer at the site is approximately 14 feet (Ref. pp. 4 and 5 of 17). The groundwater flow direction is to the southwest towards Toms River (Ref. 28, p. 3 of 28).

The total population served by groundwater from private wells located within a 4-mile radius of the site is 10,662 distributed as follows: 15 people within 0 to 1/4 mile; 45 people within 1/4 to 1/2 mile of the site; 405, within 1/2 to 1 mile; 2,541 within 1 to 2 miles; 3,554 within 2 to 3 miles; and 4,102 within 3 to 4 miles (Ref. 4, pp. 9 and 10 of 10). Documentation could not be found to establish groundwater use as a resource in the site area. Wellhead protection areas have not been defined in New Jersey (Ref. 15, p. 1 of 1).

The nearest potable well to the site is located 1,300 feet to the north and hydraulically upgradient of the site (Ref. 6, p. 6 of 8; Ref. 28, p. 3 of 28; Ref. 31, p. 1 of 1). The residence is located off the access road to the landfill near the intersection of Cross Street and Prospect Street (Ref. 6, p. 6 of 8; Ref. 31, p. 1 of 1). The well is 55 feet deep and serves three people (Ref. 6, p. 6 of 8).

The population within the 4-mile radius of the site is served by four water utilities. There are no known municipal wells located within 1 mile of the site (Ref. 31, p. 1 of 1; Ref. 38, pp. 1 through 21 of 21). There are one municipal well within 1 to 2 miles of the site serving 4,239 residents, six municipal wells within 2 to 3 miles of the site serving 17,484 residents and eight municipal wells within 3 to 4 miles of the site serving 11,281 residents (Ref. 38, p. 1 through 21 of 21).

There is a total population (private supplies + municipal supplies) of 15 utilizing groundwater within 0 to 1/4 mile of the site, 45 within 1/4 to 1/2 mile of the site, 405 within 1/2 to 1 mile of the site, 6,780 within 1 to 2 miles of the site, 21,038 within 2 to 3 miles of the site and 15,383 within 3 to 4 miles of the site (Ref. 4, pp. 9 and 10 of 10; Ref. 38, 1 through 3 of 21).

Surface Water Pathway

Surface water samples have not been collected at the Lakewood Township Landfill; therefore, the surface water pathway was evaluated on a potential-to-release basis.

The Lakewood Township Landfill site lies in a greater than 500 year floodplain (Ref. 10, p. 3 of 3). The estimated drainage area is 25.91 acres (area where waste disposal took place) (Ref. 30, pp. 1 through 14 of 14). The site topography is such that storm water should percolate into the ground and not drain off-site (Ref. 6, p. 8 of 8). Based on natural barriers, the site does not appear to be subject to flooding; however, it could not be documented that the landfill is protected against floods. The landfill does have a surface water runoff collection system; however, evidence of surface water bypassing the system to the east and west of the landfill was noted during the Ebasco site reconnaissance (Ref. 6, pp. 3 and 4 of 8). To the west the surface water discharged toward the railroad tracks and to the east the surface water discharged to the gravel pit (Ref. 6, pp. 3 and 4 of 8).

The nearest surface water body is the Grass Hollow Brook located approximately 1,300 feet to the southeast of the site (Ref. 31, p. 1 of 1). The soil surrounding the site is classified as Cohansey sand with a hydraulic conductivity of 1.0×10^{-3} cm/second (Ref. 1, Table 3-6; Ref. 9, p. 7 of 12).

Due to the distance to surface water, hydraulic conductivity of the soil, dense vegetation to the south, north and west and site-specific features (presence of a surface water collection system, raised railroad tracks to the west where surface water bypasses the collection system, gravel pit to the east where the surface water bypasses the collection system and topographically higher areas to the north and south of the site) surface water runoff from the site is not expected to reach the Grass Hollow Brook.

The 2-year, 24-hour rainfall for the site is 3.5 inches (Ref. 11, p. 2 of 2). There are no known surface water intakes along the 15-mile target distance limit. (Ref. 38, p. 16 of 18).

The probable point of entry (PPE) occurs 1,300 feet southeast of the site at the Grass Hollow Brook (Ref. 31, p. 1 of 1). The Grass Hollow Brook flows for 1.5 miles and empties into Toms River (Ref. 31, p. 1 of 1). The volumetric flow rate for the Grass Hollow Brook is estimated to fall into the small to moderate stream category (10 cubic feet/second (cfs) to 77 cfs) and there are 1.5 miles of wetlands frontage located along the Grass Hollow Brook (Ref. 19, p. 1 of 1; Ref. 32, pp. 1 and 2 of 2). Toms River flows for 4 miles before the Union Brook flows into Toms River (Ref. 31, p. 1 of 1). There were brook trout stocked in this segment of Toms River resulting in a fish production rate of 1 pound (Ref. 14, p. 4 of 6). There are 6 miles of wetlands frontage located along this segment and the approximate volumetric flow rate is 77 cubic feet/second (Ref. 19, p. 1 of 1; Ref. 32, pp. 1 and 2 of 2). Toms River flows for another 5.5 miles before its flow increases (possibly due to tidal influences) (Ref. 31, p. 1 of 1). There are 6 miles of wetlands frontage located along this segment and the approximate volumetric flow rate is 208 cubic feet/second (Ref. 12, pp. 1 and 11 of 11; Ref. 32, pp. 1 and 2 of 2). Toms River flows for another 4 miles to the end of the target distance limit (Ref. 31, p. 1 of 1). There are 4.5 miles of wetlands frontage located along this segment and the flow rate is estimated to fall into

the large stream to river category (1,000 cfs to 10,000 cfs) (Ref. 12, p. 1 of 11; Ref. 32, pp. 1 and 2 of 2).

There are no endangered species habitats located along the 15-mile target distance limit (Ref. 36, pp. 1 through 20 of 20).

Soil Exposure Pathway

There were no on-site residences noted during the Ebasco site reconnaissance and there are no workers on site (Ref. 6, pp. 1 through 8 of 8). The Ebasco site reconnaissance did not note any schools or day-care centers on or within the site area (Ref. 6, pp. 1 through 8 of 8).

There are 156 people within 0 to 1/4 mile of the site; 467 people within 1/4 to 1/2 mile; 1,765 people within 1/2 to 1 mile; 9,358 people within 1 to 2 miles; 25,809 people within 2 to 3 miles; and 25,800 people within 3 to 4 miles of the site (Ref. 4, pp. 9 and 10 of 10).

There is no fence at the site except for a gate at the access road (Ref. 6, p. 5 of 8). There are barriers around the site such as dense wooded areas to the north, south and east, train tracks to the west and a gravel pit to the east (Ref. 6, p. 5 of 8).

A soil cover has been placed over the landfill and vegetation has been established at the landfill as a result of the Phase I landfill closure; however, evidence of trespassing such as motorcycle tracks, spent shotgun shells, broken clay pigeons (used for target practice with shotguns) and vandalism (Lakewood Township's consultant stated that wells had to be replaced due to gunshot holes) (Ref. 6, p. 3 of 8). No endangered species habitats exist within the site boundaries (Ref. 36, pp. 1 through 20 of 20).

Air Pathway

Air samples have not been collected in connection with any investigation previously conducted at the Lakewood Township Landfill (Ref. 7, pp. 1 through 98 of 98; Ref. 13, pp. 1 through 20 of 20; Ref. 17, pp. 1 through 7 of 7; Ref. 20, pp. 1 through 12 of 12). A soil cover has been placed over the landfill and vegetation has been established as a result of the Phase I closure (Ref. 6, p. 3 of 8).

There were no on-site residences noted during the Ebasco site reconnaissance (Ref. 6, pp. 1 through 8 of 8). There are 156 people within 0 to 1/4 mile of the site, 467 people within 1/4 to 1/2 mile, 1,765 people within 1/2 to 1 mile, 9,358 people within 1 to 2 miles, 25,809 people within 2 to 3 miles and 25,800 people within 3 to 4 miles of the site (Ref. 4, p. 9 and 10 of 10).

There are 2 acres of wetlands located within 0 to 1/4 mile of the site, 115 acres within 1/2 to 1 mile, 375 acres within 1 to 2 miles, 641 acres within 2 to 3 miles and 1,283 acres within 3 to 4 miles of the site (Ref. 32, pp. 1 and 2 of 2).

No endangered species habitats exist within four miles of the site and there are no commercial agriculture, commercial silviculture or designated recreation areas within one half mile of the site

(Ref. 6, pp. 1 through 8 of 8; Ref. 36, pp. 1 through 20 of 20). No odor was noted at the site during Ebasco's site reconnaissance (Ref. 6, p. 8 of 8).

Summary

Existing information and newly collected data were sufficient to evaluate the Lakewood Township Landfill site. The eastern and western landfill cells were used as the only source.

Drinking water within the 4-mile target distance limit is obtained from both private wells and municipal suppliers. There are 10,662 people using private wells for their potable water supply within a four mile radius of the site and 33,004 people supplied by municipal wells within the 4-mile radius. An observed release to surface water is unlikely due to the distance to surface water (1,300 feet), permeability of the soil, dense vegetation to the south, north and west and site specific features (presence of a surface water collection system, raised railroad tracks to the west where surface water bypasses the collection system, gravel pit to the east where the surface water by passes the collection system and topographically higher areas to the north and south of the site). Surface water within the 15-mile target distance limit is not used as a potable supply. There are 18 miles of wetlands frontage along the 15-mile target distance limit, and 2,416 acres of wetlands located within a 4-mile radius of the site. There are no endangered species habitats within a 4-mile radius of the site or within the 15-mile downstream target distance limit. There are no areas of observed contamination on-site. The site is accessible to trespassers as evidenced by motorcycle tracks, spent shotgun shells and vandalism to monitoring wells. There were no air samples collected in connection with any investigation previously conducted at the Lakewood Township Landfill. A soil cap has been placed over the landfill and vegetation has been established. There are no workers or residences on-site. Approximately 63,355 people reside within four miles of the site.

Prepared by :

Kirti Shah/EA

Kirti Shah
Task Leader
Ebasco Services Incorporated

Approved by :

Dev Sachdev, Ph.D., PE
ARCS II Program Manager
Ebasco Services Incorporated

Reviewed by:

Edgar J. Aguado
Site Manager
Ebasco Services Incorporated

REFERENCES

1. U.S. Environmental Protection Agency (EPA), Hazard Ranking System, Final Rule, 40 CFR Part 300, December 14, 1990.

2. U.S. EPA, Superfund Chemical Data Matrix (SCDM), EPA 9360.4-18, July 1994 as incorporated in the PRESCORE Software, Version 3.0, Publication 9450.2200, August 1994.

3. Malcolm Pirnie, Preliminary Assessment of Lakewood Township Landfill, March 20, 1985.

4. Frost Associates, CENTRACTS Report: 1990 Census Bureau Population and Private-well Data, Lakewood Township Landfill Site, February 17, 1995.

5. Congressional Districts, Election Division, New Jersey Department of State, January 1987.

6. Field Notebook, Lakewood Township Landfill Site, On-site reconnaissance conducted on March 31, 1995, Ebasco Environmental, Langhorne, Pennsylvania.

7. Board of Chosen Freeholders, Ocean County, New Jersey, Feasibility Assessment of Northern Regional Sanitary Landfill Site, October 1981, prepared by Elson T. Killam Associates, Inc., Milburn, New Jersey.

8. Well Records and Boring Logs, Lakewood Township Landfill, March 1986, prepared by W. C. Services, Inc.

9. U.S. Geological Survey, Hydrogeologic Framework of the New Jersey Coastal Plain, Open-File Report 84-730, 1984.

10. National Flood Insurance Program and Emergency Management Agency, Flood Insurance Rate Maps, Township of Lakewood, New Jersey, Ocean County, N.J., Panel Hand I-02, March 15, 1977.

11. U.S. Department of Commerce, Technical Paper No. 40, Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years, Washington, D.C., January 1963.

12. Statistical Summaries of New Jersey Stream Flow Records, Water Resources Circular 23, State of New Jersey Department of Environmental Protection, Division of Water Resources, 1970, and Flow Calculation Sheet, Ebasco Environmental, April 1995.

REFERENCES (Cont'd)

13. Report of Geotechnical Engineering Evaluation and Phase II Design for the Proposed Closure of the Cross Street Landfill, Lakewood Township, New Jersey, prepared by French and Parrello Associates, P.A. Consulting Engineers, May 24, 1994.

14. Stocked Waters of New Jersey: Listing of Fish Stocked in New Jersey's Lakes, Streams, Ponds and Rivers, New Jersey Department of Environmental Protection and Energy, Division of Fish, Game and Wildlife, 1992.

15. Telecon: Conversation between the Department of Environmental Protection, Groundwater Quality Management and Joseph Gray, Ebasco Environmental, April 24, 1995.

16. Memorandum from Robert Hayton (NJDEP) to Robert Kunze (NJDEP), Subject: Liquid Chemical Waste Disposal at the Lakewood Township Landfill, July 9, 1985.

17. Investigative Reports, NJDEP, Subject: Lakewood Township Landfill, February 7, 1977 and March 1, 1977.

18. Memorandum from Ray Nichols (NJDEP) to Cindy Pfiederer (NJDEP), Subject: Lakewood Township Landfill's October 17, 1985 sampling episode, dated October 29, 1987, Memorandum from Richard Geransio (NJDEP) to Steve Borgianini (NJDEP), Subject: Lakewood Township Landfill's October 17, 1985 sampling episode, dated November 19, 1985 and Memorandum from Robert Hayton (NJDEP) to Dr. Jorge H. Berkowitz (NJDEP), Subject: Lakewood Township Landfill's October 17, 1985 sampling episode, dated November 21, 1985.

19. Telecon: Conversation between the United States Geological Survey and Joseph Gray, Ebasco Environmental, April 24, 1995.

20. Site Inspection Report, USEPA, Lakewood Township Landfill, June 18, 1985.

21. Memorandum from Robert Hayton (NJDEP) to Dr. Merry Morris (NJDEP), Subject: Lakewood Township Landfill, July 9, 1985.

22. Memorandum from Robert Hayton (NJDEP) to Dr. Merry Morris (NJDEP), Subject: Disposal of Construction Debris at Lakewood Township Landfill and the Submittal of Lakewood Township Landfill to the National Priority List (NPL), July 9, 1985, Memorandum from Dr. Jorge H. Berkowitz (NJDEP) to Dr. Mariann M. Sadat (NJDEP), Subject: Disposal of Construction Debris at Lakewood Township Landfill and the Submittal of Lakewood Township Landfill to the NPL, July 16, 1985, Memorandum from John J. Trela (NJDEP) to Melinda Domer (NJDEP), Subject: Submittal of Lakewood Township Landfill to the NPL, May 2, 1986, and Memorandum from Melinda Domer (NJDEP) to Bob Kunze (NJDEP), Subject: Submittal of Lakewood Township Municipal Landfill to NPL, May 1, 1986.

REFERENCES (Cont'd)

23. Memorandum from Dr. Merry L. Morris (NJDEP) to Anthony Ferro (NJDEP), Subject: Lakewood Township Landfill, February 25, 1986.

24. Memorandum from Vinne (NJDEP) to George (NJDEP), Subject: Lakewood Township Landfill, April 7, 1986.

25. Memorandums from Lakewood Township to Daniel A. DeSessa, Subject: Vandalism to Monitoring Wells at the Lakewood Township Landfill, October 4, 1986 and December 1, 1986; Memorandum from Dave Magno to John O'Brien of W. C. Services Inc., Woodbury, N. J., Subject: Vandalism to Monitoring Wells at the Lakewood Township Landfill, December 8, 1986; Memorandum from Dave Magno to NJDEP, Subject: Vandalism to Monitoring Wells at the Lakewood Township Landfill, March 31, 1987; Memorandum from Dave Magno (McSweeney and Drews) to Daniel DeSessa (Lakewood Township), Subject: Vandalized Locks at the Lakewood Township Landfill; Memorandum from Peter J. Pulko (W. C. Services, Inc., Woodbury, N. J., Subject: Vandalized Wells at the Lakewood Township Landfill and Well Abandonment Reports, NJDEP, January 31, 1990.

26. Memorandum from Ronald J. Schott (NJDEP) to the Mayor and Council of Lakewood Township, Subject: Compliance Evaluation Inspection on March 28, 1989 at the Lakewood Township Landfill, dated April 11, 1989, Discharge Surveillance Report, NJDEP, March 28, 1989, Memorandum from Thomas L. LaPointe (Lakewood Township) to NJDEP, Subject: Lakewood Township's response to the March 28, 1989 Compliance Evaluation Inspection at the Lakewood Township Landfill, dated April 21, 1989, Memorandum from Dave Magno (McSweeney and Drews) and John O'Brien (W. C. Services), Subject: Price and Time estimate for the Repair of Vandalized Wells at the Lakewood Township Landfill, dated April 25, 1989; Memorandum from Joseph Petrucelli (Lakewood Township) and Dave Magno (McSweeney and Drews), Subject: NJDEP's Compliance Inspection conducted on March 28, 1989, dated May 5, 1981, and Memorandum from Joseph Petrucelli (Lakewood Township) to Dominic K. Manco (Lakewood Township), Subject: NJDEP's Compliance Inspection conducted on March 28, 1989, dated May 9, 1989.

27. NJDEP Solid Waste Administration Order, June 10, 1989, Memorandum from NJDEP to George Buckwald (Mayor, Lakewood Township), Subject: Administrative Consent Order Concerning the Lakewood Township Landfill, October 15, 1981; NJDEP Solid Waste Administration Order, October 29, 1981; NJDEP Solid Waste Administration Order, January 26, 1982; NJDEP Solid Waste Administration Notice of Prosecution, February 4, 1982, NJDEP Solid Waste Administration, Notice of Prosecution, February 11, 1982, NJDEP Solid Waste Administration Notice of Prosecution, February 18, 1982, NJDEP Solid Waste Administration, Notice of Prosecution, March 17, 1982 and NJDEP Solid Waste Administration Order, August 15, 1980.

REFERENCES (Cont'd)

28. NJDEP Groundwater Discharge Permit for the Lakewood Township Landfill, Issued June 1, 1991.

29. Environmental Profile Laboratories, Groundwater Sampling Results, September 29, 1992.

30. Topography and Survey Plan of Blocks 515 Through 523 and P/O BLD 524 Tax Map Sheets 99 and 100, Lakewood Township; Stanley Peters Associates, Lakewood, N. J., March 11, 1985.

31. U. S. Geological Survey, 7.5 Minute Series Topographic Maps: Lakehurst, N. J.(1957 Photo revised 1971), Lakewood, N. J. (1979), Toms River, N. J. (1989) and Keswick Grove, N. J., (1957, Photo revised 1975).

32. National Wetlands Inventory, United States Department of the Interior, Fish and Wildlife Services; Wetlands Maps: Lakehurst, N. J. (March 1977), Lakewood, N. J. (March 1977), Toms River, N. J. (March 1977) and Keswick Grove, N. J. (March 1977).

33. Environmental Profile Laboratories, Groundwater Sampling Results, December 18, 1992.

34. Environmental Profile Laboratories, Groundwater Sampling Results, March 11, 1994.

35. Environmental Profile Laboratories, Groundwater Sampling Results, December 19, 1994.

36. NJDEP, Natural Heritage Program, Rare and Endangered Species Report, Lakewood Township Landfill Site, April 6, 1995.

37. Ocean County Health Department, File Search, April 18, 1995.

38. Well Information and Telecons from the New Jersey-American Water Company, Lakewood Township Municipal Utilities Authority, Manchester Township Municipal Utilities Authority and United Water Toms River to Ebasco Environmental (May 1995).

REFERENCE NO.1

Reference 1

Friday
December 14, 1990

Federal Register

Part II

Environmental Protection Agency

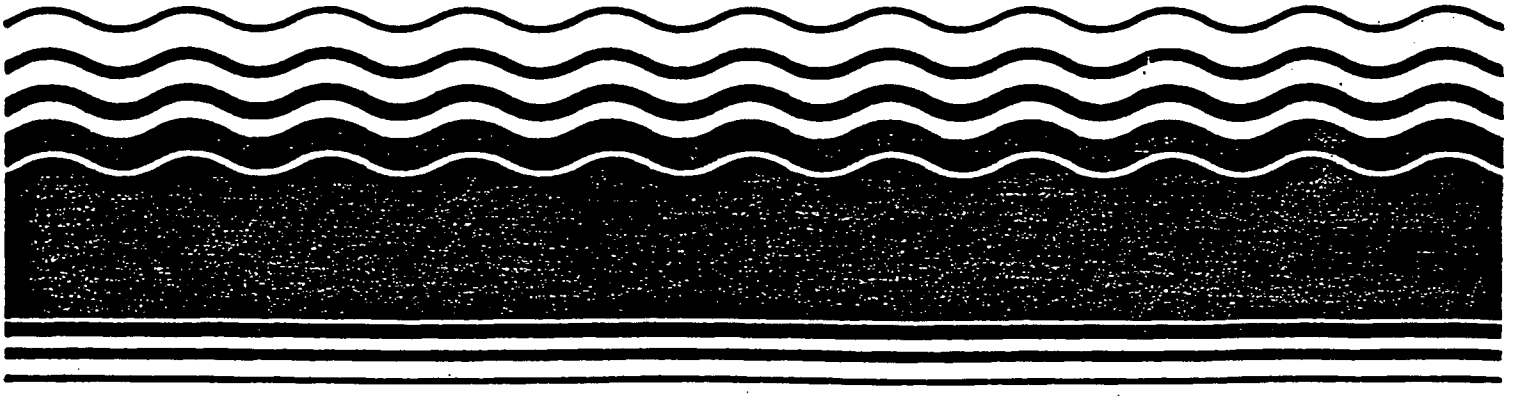
40 CFR Part 300
Hazard Ranking System; Final Rule

REFERENCE NO. 2

Environmental Protection Agency
Emergency Response (5204G)
PB94-963506
EPA 540-R-94-06
June 1994

EPA

Superfund Chemical Data Matrix



REFERENCE NO. 3

MALCOLM PIRNIE

Reference 3 1/27

N 284 JB

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT

Lakewood Twp. Landfill	156
Site Name	Site ID Number
Cross & Prospect Sts.	Lakewood, Ocean Co., NJ
Address	City, State

Date of Off-Site Reconnaissance March 20, 1985

SITE DESCRIPTION

This inactive site located off the Kennedy Ave. access road was used as a municipal landfill until 1983. It was ordered to close at that time per an NJDEP ACO.
Ocean County submitted a regionalization plan to the NJDEP in 1981 for this landfill location. The plan noted that the landfill accepted non-hazardous chemical wastes. Results for some of the wells sampled in the area showed low levels of organic compounds.

PRIORITY FOR FURTHER ACTION: High ___ Medium X Low ___ None ___

RECOMMENDATIONS

Given the potential for direct contact with unknown wastes, ground and surface water contamination, the types of materials reportedly disposed of and the light industrial/residential nature of the surrounding area, it is recommended that a site inspection be conducted.

Prepared by: M. Manto Date: April 3, 1985
REVISED MAY 24, 1985

Of: Malcolm Pirnie Inc.

MALCOLM PIRNIE

Reference 3 2/27

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT

N 284 JB

Lakewood Twp. Landfill	156
Site Name	Site ID Number
Cross & Prospect Sts.	Lakewood, Ocean Co., NJ
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Prepared by: M. Manto Date: April 3, 1985
REVISED MAY 24, 1985

Of: Malcolm Pirnie Inc.

Reference 3 3/2

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION
01 STATE: NJ | 02 SITE NUMBER: 156

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
Lakewood Township L.F.	Cross & Prospect Sts.

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG. DIST.
Lakewood	NJ	08701	Ocean		

09 COORDINATES LATITUDE	LONGITUDE	BLOCK	LOT
40 03 50.0	74 11 10.0	524	101-105

10 DIRECTIONS TO SITE (Starting from nearest public road): Rt. 9 south to Prospect St. Follow Prospect St. to Cross St. Make left onto ~~Kennedy~~ Ave. Site is on right.

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)
Lakewood Township	231 3rd. St.

03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER
Lakewood	NJ	08701	(201)-3630557

07 OPERATOR (If known and different from owner)	08 STREET (Business, mailing, residential)

09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER
			( )

13 TYPE OF OWNERSHIP (Check one)
☐ A. PRIVATE ☐ B. FEDERAL _____ (Agency name) ☐ C. STATE ☐ D. COUNTY ☒ E. MUNICIPAL
☐ F. OTHER _____ (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☐ A. RCRA 3001 DATE RECEIVED: ____ MONTH DAY YEAR ☐ B. UNCONTROLLED WASTE (CERCLA 103c) DATE RECEIVED: ____ MONTH DAY YEAR ☒ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
☒ YES DATE 5/31/84 MONTH DAY YEAR ☐ NO

BY (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR ☒ C. STATE ☐ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER _____ (Specify)

CONTRACTOR NAME (S)

02 SITE STATUS (Check one)
☐ A. ACTIVE ☒ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION
Unk. BEGINNING YEAR | 1984 ENDING YEAR ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
Non-hazardous chemical waste were reportly disposed of in the 1970's. (Attachments A,B,C)

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
Potential exists for soil, surface and ground water contamination. (Attachment A,B,C)

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☒ B. MEDIUM (Inspection required) ☐ C. LOW (Inspection on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NUMBER
Fred Schmitt	NJDEP/BEERA	(609)-2921215

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
M. Manto		M. Pirnie Inc	(914)-6942100	4/3/85 MONTH DAY YEAR

EPA FORM 2070-12 (7-81)

Reference 3 4/27

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NJ	156

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- [X] A. SOLID
- [ ] B. POWDER, FINES
- [ ] C. SLUDGE
- [ ] D. OTHER (Specify)
- [ ] E. SLURRY
- [ ] F. LIQUID
- [ ] G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS
CUBIC YARDS Unknown
NO. OF DRUMS

03 WASTE CHARACTERISTICS (Check all that apply)

- [X] A. TOXIC
- [ ] B. CORROSIVE
- [ ] C. RADIOACTIVE
- [ ] D. PERSISTENT
- [X] E. SOLUBLE
- [ ] F. INFECTIOUS
- [ ] G. FLAMMABLE
- [ ] H. IGNITABLE
- [X] I. HIGHLY VOLATILE
- [ ] J. EXPLOSIVE
- [ ] K. REACTIVE
- [ ] L. INCOMPATIBLE
- [ ] M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			Landfill was approved to
OLW	OILY WASTE			receive municipal soild
SOL	SOLVENTS	unknown		waste, dry sewage sludge,
PSD	PESTICIDES			bulky waste, and
OCC	OTHER ORGANIC CHEMICALS			construction debris.
IOC	INORGANIC CHEMICALS			(Attachment A)
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
SOL	Benzene	71-43-2	Well Sample	>1	ppb
SOL	Toluene	108-88-3	Well Sample	>1	ppb
SOL	Ethylbenzene	100-41-4	Well Sample	>1	ppb
SOL	Xylene	1330-20-7	Well Sample	>1	ppb
	Attachments B,C				

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

Malcolm Pirnie: Attachment B,C

EPA FORM 2070-12(7-81)

Reference 3 5/2.

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: NJ | 02 SITE NUMBER: 156

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. GROUNDWATER CONTAMINATION — 02 [X] OBSERVED (DATE: 10/81) [ ] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
Ground-water contamination from leachate was reported. (Attachments A,B,C)

01 [X] B. SURFACE WATER CONTAMINATION — 02 [ ] OBSERVED (DATE: _____) [X] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
Surface streams run through the site and leachate has been observed on-site. Potential exists for contamination by buried materials. (Attachment A)

01 [ ] C. CONTAMINATION OF AIR — 02 [ ] OBSERVED (DATE: _____) [ ] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

01 [X] D. FIRE/EXPLOSIVE CONDITIONS — 02 [X] OBSERVED (DATE: 4/13/81) [ ] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
A welding-type gas tank exploded on-site. Similar tanks were returned to the generator. (Attachment D)

01 [X] E. DIRECT CONTACT — 02 [ ] OBSERVED (DATE: _____) [X] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
Potential exists if buried wastes contaminate streams running through site. (Attachments A,C)

01 [X] F. CONTAMINATION OF SOIL — 02 [ ] OBSERVED (DATE: _____) [X] POTENTIAL [ ] ALLEGED
03 AREA POTENTIALLY AFFECTED: _____ (Acres) 04 NARRATIVE DESCRIPTION
Potential exists for soil contamination from buried materials. (Attachments A,C)

01 [X] G. DRINKING WATER CONTAMINATION — 02 [ ] OBSERVED (DATE: _____) [X] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
Private wells in the area did not show contamination. The 10/81 report indicates some elevated levels of organics in monitoring wells. (Attachment A,B,C)

01 [X] H. WORKER EXPOSURE/INJURY — 02 [X] OBSERVED (DATE: 4/13/81) [ ] POTENTIAL [ ] ALLEGED
03 WORKERS POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
A welder's type gas tank exploded on-site. Two similar tanks were returned to the generator. (Attachment D)

01 [X] I. POPULATION EXPOSURE/INJURY — 02 [ ] OBSERVED (DATE: _____) [X] POTENTIAL [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
Potential exists due to leachate streams, history of inadequate cover and apparent accessibility of site. (Attachments A,B,C,G)

Reference 3 6/27

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: NJ | 02 SITE NUMBER: 156

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☒ M. UNSTABLE CONTAINMENT OF WASTES (Spills/runoff/standing liquids/leaking drums) — 02 ☒ OBSERVED (DATE: 7/30/82) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION
During two site visits, drums were observed on-site. Inadequate cover has been applied. (Attachments F,G)

01 ☒ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
Potential exists if streams on-site are contaminated by buried materials. (Attachments A,B,C)

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☒ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☒ OBSERVED (DATE: 7/30/82) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
During two site visits, drums were observed on-site. (Attachments F,G)

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS
The Ocean County Planning Agency reports no current monitoring of area wells.

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS
Administrative Consent Orders from 1981 and 1983 ordered the township to cease accepting waste and submit a closure plan to NJDEP. Kennedy Ave. is the access road to the Cross St./Prospect St. landfill. (Attachments E)

V. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)
NJDEP/DWM, HSMA Files: Attachments D-G
Malcolm Pirnie: Attachment A - C
Phone Memo: Ocean County Planning Agency

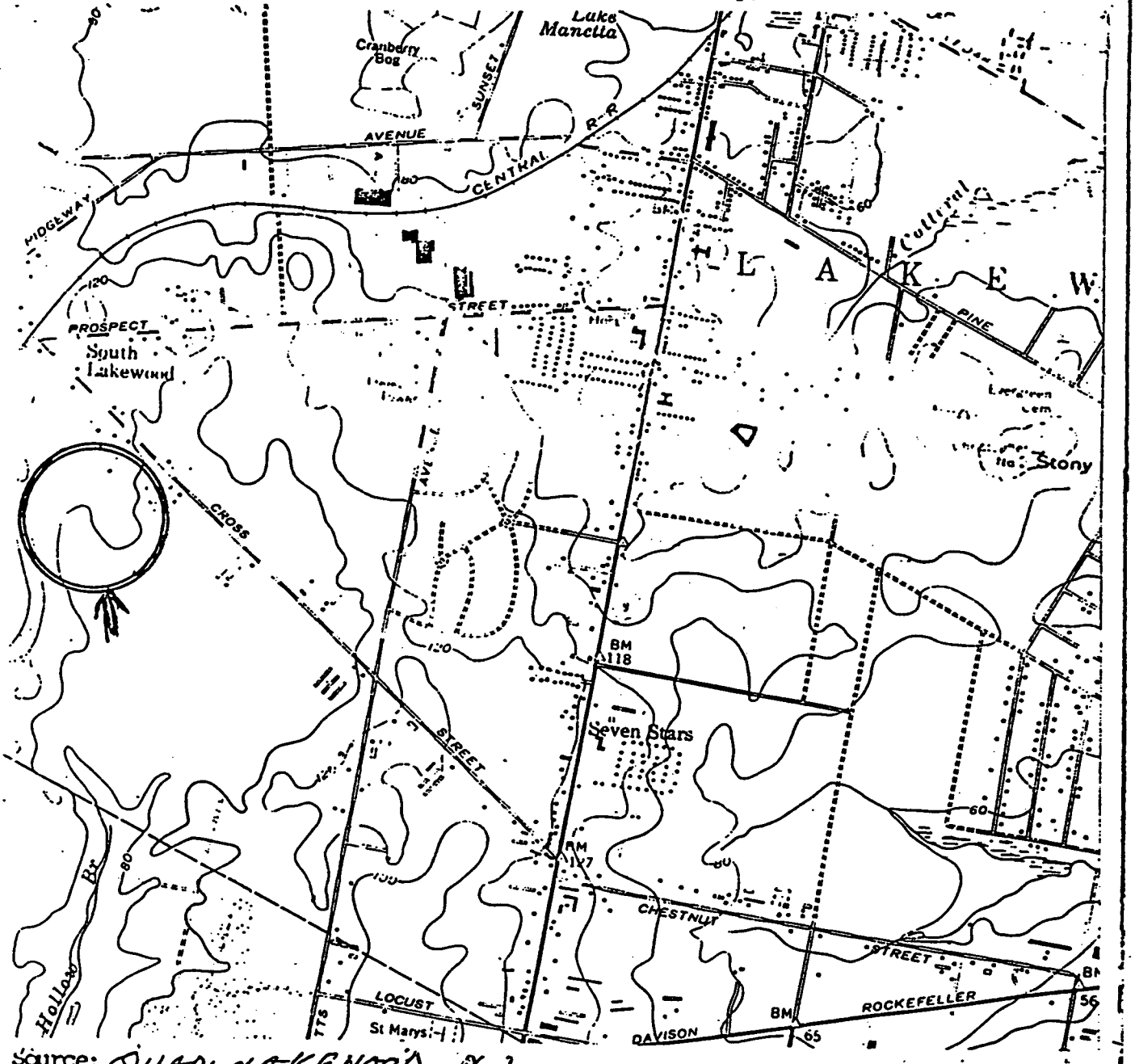
Reference 3 7/27

LAKEWOOD TWP. LANDFILL
Site Name

156.
Site ID Number

KENNEDY AVE
Address

LAKEWOOD. N.J
City, State



Source: QUAD. LAKEWOOD, N.J.
LAT 40° 03' 30"
LONG 74° 11' 10"

Prepared by: Ralph K Bardan

Date: March 20 1985

SAFE International

Reference 3 8/27

CERTIFICATION
of Approved
REGISTRATION STATEMENT FOR A SOLID WASTE FACILITY

Issued By

New Jersey Department of Environmental Protection

Bureau of Solid Waste Management

This certifies that Township of Lakewood (name)
Municipal Building., 231 Third Street., Lakewood, N.J. 08701 (address)
has submitted an up-dated registration statement and has paid the annual fee of $500 for the operation of a Sanitary Landfill
located on Lot Nos. 101-105
and Block Nos. 524
at Kennedy Ave., Lakewood, N.J. 08701 (address)
under Registration No. 15303001
for the purpose of disposal of the following approved classes of refuse
Municipal (Household, Commercial, Institutional), Dry Sewage Sludge, Bulky Waste, Construction, Demolition

and that said operator has submitted an engineering design which is approved

This Certification may be withdrawn for failure to comply with either the conditions or limitations which may be specified on the approved registration, or for failure to implement all features contained in the approved engineering design, or for failure to correct violations of any of the rules or regulations of the Department.

This Certificate Expires 6/30/75

Bernard F. Lisi
For the Bureau of Solid Waste Management

ATTACHMENT 9

Reference Enf. file 3 4/27
1514A

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
SOLID WASTE ADMINISTRATION
32 EAST HANOVER STREET, TRENTON, N.J. 08625

JACK STANTON
DIRECTOR

LINO F. PEREIRA
ADMINISTRATOR
SOLID WASTE MANAGEMENT

August 10, 1981

Mr. Jim Gardner
Suprv. Environmental Engineer
Building 5
Naval Air Engineering Center
Lakehurst, NJ 08733

Dear Sir:

An inspection by one of our field investigators of the Lakewood Landfill on April 13, 1981 at 12:15 p.m. revealed that a gas tank (welder's type) had exploded onsite. Specifically, a township employee stated that he was pushing a roll off load when the tank suddenly took off as the gases inside propelled out of the top of it. The tank hit the garbage compactor and broke the front window.

In addition to this tank, there were two other tanks which were picked up and brought back to the generator - Lakehurst Naval Engineering Center.

Under N.J.A.C. 7:26-2.5.27, (Waste Identification and Definition), these tanks are defined as Waste I.D. #17, Dry Hazardous Waste. This material is unacceptable for disposal at the Lakewood Landfill, and must be disposed of at a registered hazardous waste disposal facility utilizing a N.J. manifest.

For more information, contact David Potts of my staff at (609) 292-9877.

Very truly yours,

Ronald T Corcory

ATTACHMENT D-1

Ronald T. Corcory
Assistant Chief
Bureau of Hazardous Waste

RTC:DP:H2-B8:hjg

Reference 3 10/27

10/9/81

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
JOHN FITCH PLAZA, CN027, TRENTON, N.J. 08625

(IN THE MATTER OF)
(THE LAKEWOOD TOWNSHIP)
(SOLID WASTE DISPOSAL AREA)
(OCEAN COUNTY)

ADMINISTRATIVE CONSENT ORDER

The following Administrative Consent Order is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (hereinafter, "the Department") and duly delegated to the Director, Division of Environmental Quality pursuant to his authority under the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq.

FINDINGS

1. On July 31, 1980, the Department issued the Certification of Approval with Modification of the Ocean County District Solid Waste Management Plan (hereinafter, "the Plan"). This Plan provided for the closure of the Lakewood Township Landfill (hereinafter, "the Landfill") and directed the waste generated by Lakewood Township (hereinafter, "the Township") to the Ocean County Landfill in Manchester Township, Ocean County as of November 1, 1981. The contents of said Plan are incorporated by reference.

ATTACHMENT E

New Jersey Is An Equal Opportunity

Reference 3 11/27

2. Subsequent to the issuance of the Plan, the parties hereto met to discuss an extension of the November 1, 1981 closure date. Having successfully negotiated an agreement, the Township and the Department enter into this Administrative Consent Order without trial or adjudication or finding of any issues of law and without admission of liability by the parties with respect to any such issues.

NOW, THEREFORE, by agreement of the parties, it is hereby ORDERED that the Township, its principals, agents and assigns shall:

1. Submit to the Department by ~~October 15, 1981~~ December 31,1981*, a plan including sufficient graphic descriptions, which provides for the closure of the landfill in an environmentally sound manner. This plan shall include, but is not limited to, engineering requirements (e.g. final grades, cover and seeding), post closure monitoring (e.g. groundwater and surface water contamination, and/or methane gas migration), and any required remedial measures (e.g. gas venting, leachate collection and control, and/or physical structures, such as dikes or berms); and shall include an implementation or schedule which lists key dates for their achievement.

2. Cease acceptance of all waste by December 31, 1981.

3. As of January 1, 1982, take its waste to the Ocean County Landfill, Inc., in accordance with the Plan.

4. If and when the Freeholders of Ocean County petition to amend the Certification of Approval with Modification of the Ocean County District Solid Waste Management Plan to direct Lakewood, Township's waste to a facility other than the Ocean County Landfill Inc., this Administrative Consent Order shall become null and void.

* However, the Township agrees pursuant to a telephone conversation with Karen Jentis, Enforcement Manager, to submit a preliminary Engineering Plan to DEP by November 15, 1981.

ATTACHMENT E2

Reference 3 12/27

RESERVATION OF RIGHTS

This ADMINISTRATIVE CONSENT ORDER shall be fully enforceable in the New Jersey Superior Court having jurisdiction over the matter and signatory parties; it shall also constitute an Administrative Order pursuant to the Solid Waste Management Act, N.J.S.A. 13:1E-1, et seq. and shall not prohibit, prevent or otherwise preclude the Department from taking whatever actions it deems appropriate to enforce the solid waste management laws of the State of New Jersey in any manner not inconsistent with the terms of this Administrative Consent Order, and shall not prohibit, prevent or otherwise preclude the Department from seeking full enforcement of the Administrative Order, upon a determination by the Department that the Township has failed to comply with any requirements of this Order. In such an event, Lakewood Township shall be entitled to a full hearing pursuant to law.

Upon entry of this Administrative Consent Order, Lakewood Township hereby waives its right to a hearing on this Order except as provided hereinabove.

DATED 10/14/81

Edward J. Londres, Assistant Director
Enforcement Branch

DATED October 9, 1981

BY: H. George Buckwald
FOR THE TOWNSHIP

H. GEORGE BUCKWALD
NAME (PRINT OR TYPE)

MAYOR
TITLE

ATTACHMENT E3

Reference 3 13/27

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
120 Rt. 156, Yardville, N.J. 08620

DR. MARWAN M. SADAT, P.E.
DIRECTOR

LINO F. PEREIRA
DEPUTY DIRECTOR

IN THE MATTER OF
LAKEWOOD TOWNSHIP SOLID WASTE
DISPOSAL FACILITY #1514A

AMENDED ADMINISTRATIVE
CONSENT ORDER

The following FINDINGS are made and ORDER is issued pursuant to the authority vested in the Commissioner of the New Jersey Department of Environmental Protection (Department) and duly delegated to the Assistant Director for Enforcement and Field Operations, Division of Waste Management, under the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq.

FINDINGS

1) Lakewood Township operates a solid waste disposal area located on Kennedy Avenue, Lakewood Township, Ocean County.

2) Lakewood Township did submit engineering designs to the Department dated October 1970 with revisions June 1971 and July 1971.

3) The Department did review said engineering designs and issued a Certificate of Registration for Solid Waste Disposal and/or Processing facility dated October 24, 1972 specifically for Block 524, Lots 102, 103 and 104.

4) The maximum final elevation as shown on the approved engineering design for Block 524, Lots 102, 103 and 104 was not to exceed elevation 95+.

5) Lakewood Township did submit to the Department an annual topography map prepared by Stanley B. Peters, P.E.-L.S., dated April 27, 1981. Said map shows that elevations of deposited solid waste have reached 129+ feet. In addition, solid waste has been deposited beyond the boundary limits of Block 524, Lots 102, 103 and 104 in violation of N.J.A.C. 7:26-2.2(d).

6) N.J.A.C. 7:26-2.2(d) states:

ATTACHMENT E9

Reference 3.14.21

No person shall engage in disposal of solid waste in this state if such an operation does not meet the operational requirements listed in this subchapter. In addition, each disposal facility must comply with any conditions or limitations which may be specified on the approved registration. Approved registrations are further contingent upon implementation of all features contained in the approved engineering design.

7) Departmental personnel have inspected the Lakewood Township Landfill and have cited the following violations during 1983:

Inspection of September 9, 1983:

N.J.A.C. 7:26-2.5(f) - Failure to control the scattering of papers and other lightweight materials.

N.J.A.C. 7:26-2.5(n) - Failure to apply adequate daily cover.

N.J.A.C. 7:26-2.5(q) - Failure to maintain the grade and thickness of cover material until stabilized.

Inspection of August 1, 1983:

N.J.A.C. 7:26-2.2(d) - Failure to comply with approved registration.

N.J.A.C. 7:26-2.5(f) - Failure to control the scattering of papers and other lightweight materials.

N.J.A.C. 7:26-2.5(m) - All exposed surfaces of solid waste shall be covered with daily cover material, or intermediate cover material, or final cover material at the close of each operating day. The exposed surface of solid waste shall not exceed 15,000 square feet, and in no case shall any solid waste be exposed in excess of 24 hours.

N.J.A.C. 7:26-2.5(n) - Failure to apply adequate daily cover.

N.J.A.C. 7:26-2.5(q) - Failure to maintain the grade and thickness of cover material until stabilized.

Inspection of March 9, 1983:

N.J.A.C. 7:26-2.5(f) - Failure to control the scattering of papers and other lightweight materials.

N.J.A.C. 7:26-2.5(q) - Failure to maintain the grade and thickness of cover material until stabilized.

Inspection of January 18, 1983:

N.J.A.C. 7:26-2.5(f) - Failure to control the scattering of papers and other lightweight materials.

ATTACHMENT EA

Reference 3-15/27

N.J.A.C. 7:26-2.5(k) - Failure to maintain an adequate water supply and/or fire fighting equipment on site, fire fighting procedures shall be posted.

N.J.A.C. 7:26-2.5(m) - All exposed surfaces of solid waste shall be covered with daily cover material, or intermediate cover material, or final cover material at the close of each operating day. The exposed surface of solid waste shall not exceed 15,000 square feet, and in no case shall any solid waste be exposed in excess of 24 hours.

N.J.A.C. 7:26-2.5(q) - Failure to maintain the grade and thickness of cover material until stabilized.

ORDER

NOW, THEREFORE, IT IS HEREBY ORDERED that Lakewood Township, its principals, agents, employees, successors, assigns, tenants, and any receiver or trustee in bankruptcy, (should such an entity be appointed to take control of the facility which is the subject of this Order) shall:

8) Cease the acceptance and disposal of all solid waste at the Lakewood Township Landfill by March 30, 1984.

9) Submit to the Department by March 30, 1984, a closure plan in accordance with N.J.A.C. 7:26-1.4, 2.9 and 2.13, "Collection and Disposal of Waste, Sanitary Landfill Closure and Post-Closure Requirements" which became effective June 6, 1983. Submit closure plan to:

N.J.D.E.P.
Division of Waste Management
Bureau of Compliance and Enforcement
120 Route 156
Yardville, NJ 08620
Attention: Robert Powell

10) Submit to the Department by March 1, 1984, an application for a New Jersey Pollutant Discharge Elimination System (NJPDES) Permit pursuant to N.J.A.C. 7:14A-1 et seq.; and comply with all terms and conditions of NJPDES issued by the Division of Water Resources. Contact: Mr. Arnold Shiffman, Administrator, Water Quality Management Element, (609) 292-5262.

11) Cover the facility with a total of two (2) feet of cover material by April 30, 1984. Upon final review by the Department of the closure plans and NJPDES ground water analytical results, the Department will notify Lakewood Township of any additional final cover or closure requirements.

ATTACHMENT E5

Reference 3 1/2

orm Swm-004

MEMORANDUM

State of New Jersey
Department of Environmental Protection

TO: File

INVESTIGATIVE REPORT

FROM: BRIAN PETITT

DATE: 7/30/82

SUBJECT: LAKEWOOD TWP. LF #1514A OCEAN CO.

At approx 10:20 on 7/30/82, I entered this site to perform a routine inspection. I was accompanied by Mike Tompkins (SWA). We were immediately greeted by a machine operator who asked us to wait for Mr. Gilbert Carlson before beginning our inspection.

Note: While waiting for Mr Carlson, I noticed a 55 gal drum on a side slope of the fill. (See sketch Area-A and photo). The drum was marked "Bel-Ray Co. Inc Farmingdale, NJ BA-120 SUMMER 400 LBS. NET phone: 201-938-2421 TERMALENE"

After Mr Carlson's arrival, I informed him that I would have to leave the site and report this drum to the SWA office. I asked him not to move the drum until I receive instruction from my supervisor.

At approx 11:30 I called the office, informed Jeni Edwards (SWA) of the drum, and was instructed to inform Mr Carlson that the drum should be "set-aside" until (SWA) Hazardous Waste personnel arrive.

When I returned to the landfill, I was

Reference 3 17/27

Form Swm-004

M E M O R A N D U M

State of New Jersey
Department of Environmental Protection

TO: File

INVESTIGATIVE REPORT

FROM: BRIAN PETITT

DATE: 7/30/82

SUBJECT: LAKEWOOD TWP LF # 1514 A OCEAN CO.

informed that Mr Carlson had left. I then contacted Mr. Pete Coulis, Asst. Sup of Public Works, (VIA two-way radio); and inform him of how the drum should be handled.

2.5.M. An area apprx. 50' x 50' consisting of bldg demo. filled in a low area, was observed. See sketch Area-B. Mr. Edward Green, machine operator, stated that this area was a "wash-out" that was filled with bldg demo. to stabilize the ground.

2.5.M. An area apprx 100' x 160' consisting of exposed garbage, was noted. See sketch Area-C.

2.5.M. An area apprx 15' x 40' consisting of wood scraps, was observed. Note: This area is where the large pile of wood was in the past. It appears that the wood has been covered and this load was recently dumped. See sketch area-D.

2.5.Q. An area apprx 30' x 40' consisting of erosion on the side slope, was noted. See sketch Area-

2.5.Q. An area apprx 30' x 60' consisting of erosion on the side slope, was noted. See sketch Area-F and photo.

ATTACHMENT F1

Reference 3 18/27

Form Swm-004

M E M O R A N D U M

State of New Jersey
Department of Environmental Protection

TO: File

INVESTIGATIVE REPORT

FROM: Brian Pettitt

DATE: 7/30/82

SUBJECT: Lakewood Twp LF # 1514A

OBS #5 | A large excavated pit contained ponded water. This area might contain groundwater. Leachate is presently draining in the direction of this area (see obs #4)

Note: After this inspection we checked collector/hauler registration cards on approx 10 trucks. We left this site at approx 2 PM.

ATTACHMENT F3

Reference 3 19/27

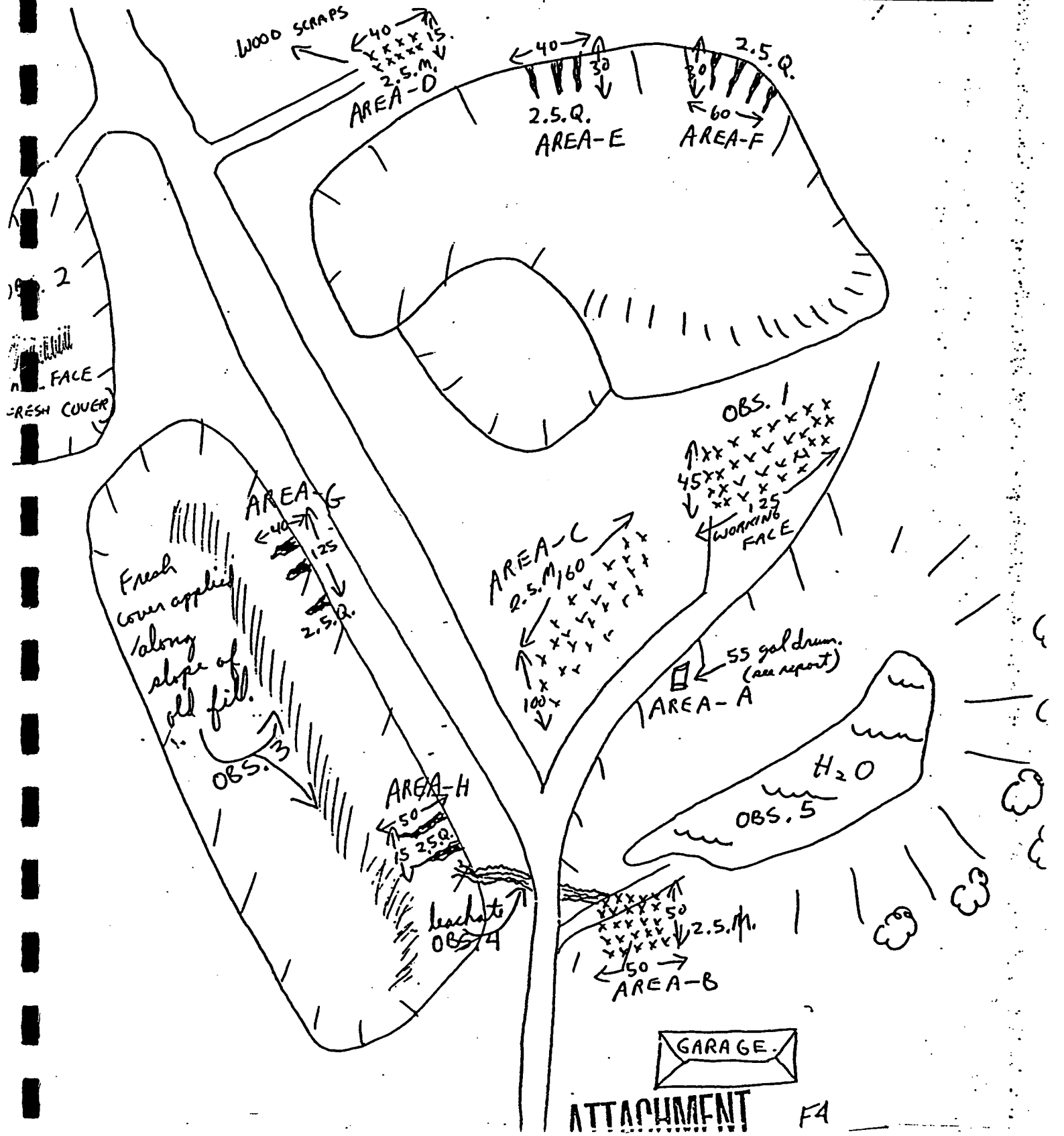
MEMO

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO _____

FROM BRIAN PETITT DATE 7/30/82

SUBJECT LAKEWOOD LF # 1514 A OCEAN CO



ATTACHMENT F4

WM-008 A

Reference 3 20/27

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT

INSPECTION REPORT

NARRATIVE

NAME OF FACILITY Lakewood Twp. DATE [illegible]-[illegible]-84

CHAPTER CITATION	DESCRIPTION
*	THIS INSPECTION IS ONLY TO [illegible] TERM'N OF [illegible] AGREEMENT [illegible] AT [illegible] BY [illegible]
7:26-2.5 P	UPON ARRIVING AT THIS [illegible] THIS WRITER NOTED NUMEROUS AREAS WHERE [illegible] HAS TAKEN PLACE. ALSO IN NUMEROUS AREAS REFUSE [illegible] PROTRUDING THROUGH APPLIED COVER MATERIAL.
	IT IS THEREFORE THIS WRITER'S OPINION THAT LAKEWOOD TWP IS NOT IN COMPLIANCE WITH THE ABOVE MENTIONED ORDER
	MR. FERRARO OF THE D.P.W. [illegible] AWARE OF THIS INSPECTION. DURING THE COURSE OF THE INSPECTION NO [illegible] C.H.D INSPECTOR WAS PRESENT
	NOTE:
	ON [illegible]-[illegible]-84 THIS WRITER [illegible] MR. [illegible] AS OF THE LAKEWOOD TWP D.P.W. [illegible] TELEPHONE AND INFORMED MR [illegible] OF THE ABOVE [illegible]

ATTACHMENT 6

MALCOLM PIRNIE

OFF – SITE RECONNAISSANCE

Date: MARCH 20, 1985 Time In 10:30 Out 11:30 A.M

Site ID No. 156

Site Name: LAKEWOOD TWP L.F.

Location: LAKEWOOD TWP

Address: KENNEDY AVENUE

City, County LAKEWOOD, OCEAN COUNTY Zip: N.J.

Personnel:	Title:
RATAN K. BARDHAN	T2
MANOJ S. SHAH	P3

Conditions: SUNNY & MILD Temperature: 38°

Any evidence of imminent hazard? NO Illegal Dumping? NONE SEEN

Uncapped Monitoring Wells? NONE SEEN If Yes, Notify NJDEP

Signature: Ratan K Bardhan Date: MARCH 20 1985

Witness: Manoj shah Date: MARCH 20, 1985.

Reference 3 22/27

MALCOLM PIRNIE

PHOTO LOG

Subject: LAKEWOOD TWP. L.F. Site ID No. 156

Date: MARCH 20, 1985 Page No.

ASA:

Frame No:	Object photographed:*	Location of photographer:*	Compass heading:
156-15	RAIL LINE	ON WEST SIDE OF CROSS STREET.	SOUTH-WEST
156-16	EDGE OF LANDFILL	ON SOUTH SIDE OF RAIL LINE	SOUTH-WEST
156-17	LANDFILL AREA	ON NORTH SIDE OF RAIL LINE.	WEST
156-18	LANDFILL AREA	ON WEST SIDE OF CROSS ROAD.	NORTH

*Indicate on sketch or map if possible

Signature: J K Bardhan Date: March 20 1985

Witness: Manojchah Date: March 20, 1985

MALCOLM PIRNIE

SITE NAME: LAKEWOOD TWP. LANDFILL

156

ID NO: 15-14.1

LOCATION: KENNEDY AVE, LAKEWOOD TWP., OCEAN.

FILE	SEARCH DATE	REVIEWER	RCRA 3001 FORM	CERCLA 103C FORM	PRELIMINARY INSP. REPORT	FIELD INSPECTION REPORTS	AGENCY INTERNAL MEMOS	RESP. PARTY CORRESPONDENCE	FORMAL REPORTING DOCUMENTS	SITE SKETCHES	ANALYTICAL DATA	SECOND SEARCH DATE	REMARKS	QA CHECK
NJDEP DRW	01-28-85	MOHAN SARDESAI	NF	NF	✓	✓	✓	✓	✓	✓	✓		Violation Notice issued 5/31/84 for failure to apply & appeal. Final Cover Material as per amended administrative Consent order.	

CODES:

✓ REVIEWED AND COPIED
X REVIEWED BUT NOT COPIED
NF NOT FOUND

Reference 3 23/27

MALCOLM PIRNIE

156

SITE NAME: LAKEWOOD TWSP. LANDFILL

ID NO: 156

LOTS, 102, 103, 104
LOCATION: BLK. 524
KENNEDY AVE.
LAKEWOOD
OCEAN

FILE	SEARCH DATE	REVIEWER	RCRA 3001 FORM	CERCLA 103C FORM	PRELIMINARY INSP. REPORT	FIELD INSPECTION REPORTS	AGENCY INTERNAL MEMOS	RESP. PARTY CORRESPONDENCE	FORMAL REPORTING DOCUMENTS	SITE SKETCHES	ANALYTICAL DATA	SECOND SEARCH DATE	REMARKS	QA CHECK
DW M TRENTON	1/29/85	F.M.				+	+	+	+					

CODES:

✓ REVIEWED AND COPIED
X REVIEWED BUT NOT COPIED
NF NOT FOUND

Reference 8 24/27

Reference 3 25/27

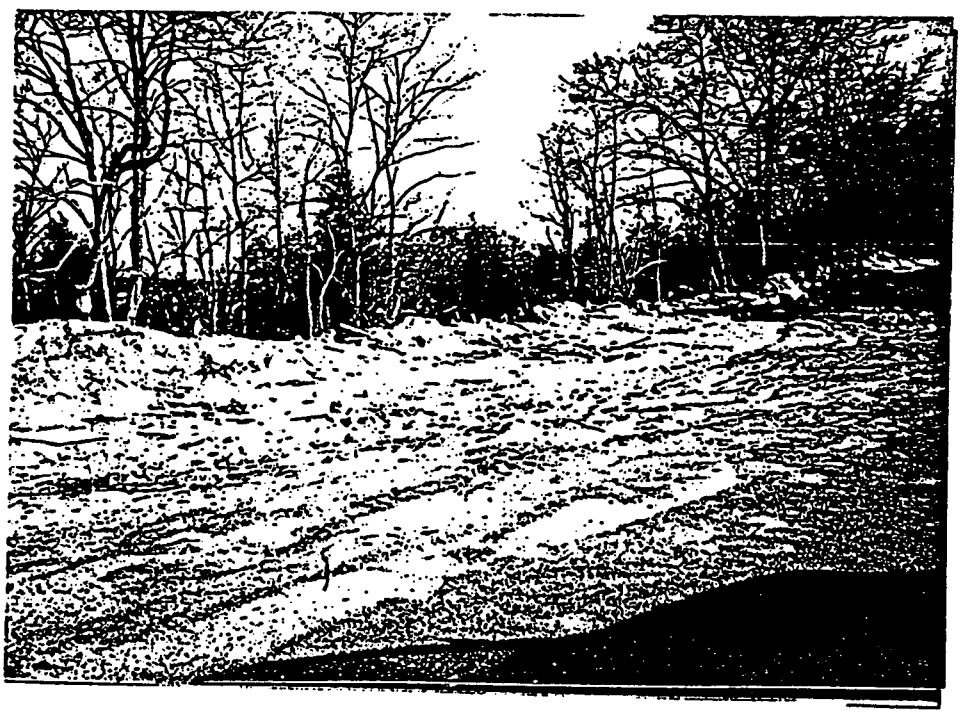
SITE: LAKEHOOD THP. LF

I.D. 156

DATE: MARCH 20, 1985

FRAME: 156-15 TIME: 10:30 - 11:30 DIRECTION: SOUTH WEST.

DESCRIPTION: SHOWS RAIL LINE



FRAME: 156-16 TIME: 10:30 - 11:30AM DIRECTION: SOUTH WEST.

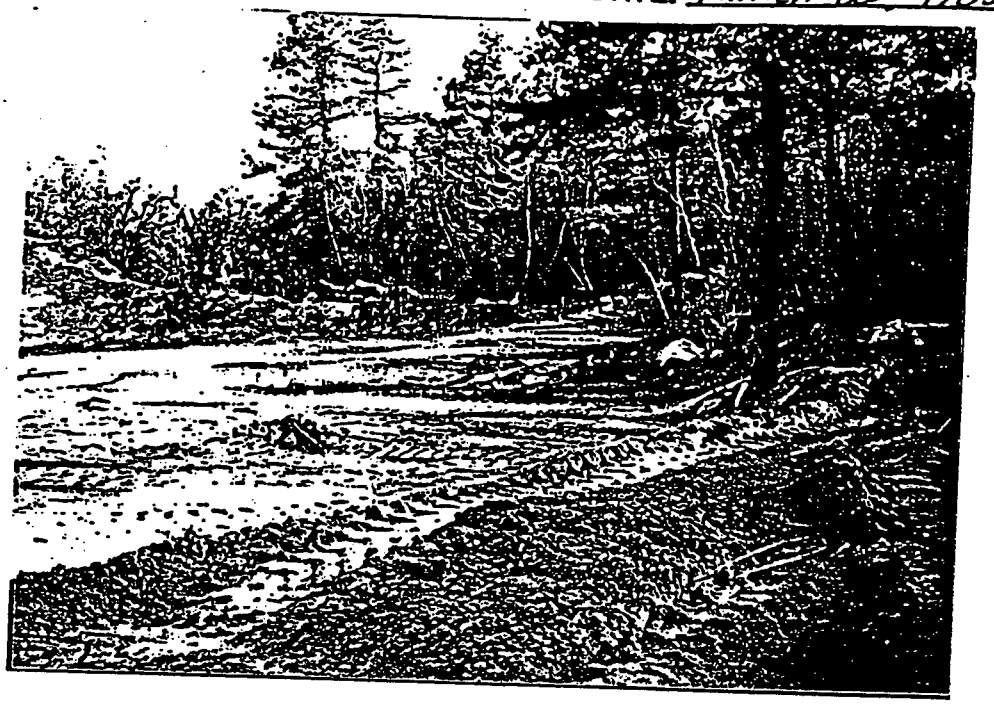
DESCRIPTION: SHOWS EDGE OF LANDFILL

SITE: LAKEWOOD TWP L.F. Reference 3

I.D. 156.

DATE: MARCH 20 1985-

26/27



FRAME: 156-17 TIME: 10:30A.M-11:30A.M/ DIRECTION: WEST.

DESCRIPTION: SHONS LANDFILL AREA

FRAME: 156-18 TIME: 10:30A.M-11:30A.M DIRECTION: NORTH

DESCRIPTION: SHONS LANDFILL AREA

SITE: LAKEWOOD TWP L.F. Ref. #3

I.D. 156.

DATE: MARCH 20 1985 - 27/27

FRAME: 156-17 TIME: 10:30A.M-11:30A.M/ DIRECTION: WEST.

DESCRIPTION: SHONS LANDFILL AREA

FRAME: 156-18 TIME: 10:30A.M-11:30A.M DIRECTION: NORTH

DESCRIPTION: SHONS LANDFILL AREA

REFERENCE NO. 4

FROST ASSOCIATES

Reference 4 1/10

P.O.Box 495, Essex, Connecticut 06426
(203) 767-7644 FAX (203) 767-1971

February 17, 1995

To: Ebasco Services Inc.
P.O Box 661
Lyndhurst, New Jersey 07071

Attn: Edgar Aguado

Fr: Frost Associates
P.O. Box 495
Essex, Conn 06426

Tel: (203) 767-7644
Fax: (203) 767-1971

Sub: Lakewood Township Landfill
Cross & Faraday Streets, Lakewood, NJ

CERCLIS: NJD980771711

Job: 50102

Site Longitude: 74-14-36 74.243332
Site Latitude : 40-03-56 40.065559

The CENTRACTS report below identifies the population, households, and private water wells of each Block Group that lies within, or partially within, the 4, 3, 2, 1, .5, and .25, mile "rings" of the latitude and longitude coordinates above. CENTRACTS may have up to ten radii of any length. 1000 block groups, and 15000 block group sides.

CENTRACTS uses the 1990 Block Group population and Block Group house count data found in the Census Bureau's 1990 STF-1A files. The sources of water supply data are from the Bureau's 1990 STF-3A files. The boundary line coordinates of the Block Groups were extracted from the Census Bureau's 1990 TIGER/Line Files.

CENTRACTS reports are created with programs written by Frost Associates, P.O. Box 495, Essex, Conn. The code was written using Microsoft's Quick-Basic Ver. 4.5.

Latitude and Longitude coordinates identifying a site are entered in degrees and decimal degrees. One or more county files holding Block Group boundary lines are selected for use by CENTRACTS by determining whether the site coordinates fall within the minimum and maximum Lat\Lon coordinates of each county in the state.

Each Block Group line segment has Lat\Lon coordinates representing the "From" and "To" ends of that line. All coordinates from the selected county files are read and converted from degrees, decimal degrees to X\Y miles from the site location. Each line segment is then examined whether it lies within or partially within the maximum ring from the site.

The unique Block Group ID numbers of each line segment that lie within the maximum ring are retained. All Block Group boundary lines matching the Block Group numbers are then extracted from the respective county files to obtain all sides of the included Block Groups. Boundary records are then sorted in adjacent side order to determine the shape and area of each Block Group polygon.

A method to solve for the area of a polygon is to take one-half the sum of the pro-

Reference 4 2/10

ducts obtained by multiplying each X-coordinate by the difference between the adjacent Y-coordinates. For a polygon with coordinates at adjacent angles A, B, C, D, and E. The formula can be expressed:

Area = 1/2{Xa(Ye-Yb)+ Xb(Ya-Yb)+ Xc(Yb-Yd)+ Xd(Yc-Ye)+ Xe(Yd-Ya)}

For each ring, the selected Block Groups will be inside, outside, or intersected by the ring. When a polygon is intersected, the partial Block Group area within that ring is calculated using the method described below.

When a ring intersects a Block Group, the intersect points are solved and plotted at the points where the ring enters and exits the shape. The chord line, a line within the circle connecting the intersect points is determined. This chord line is used to calculate the segment area, the half moon shape between the chord line and the ring, and the sub-polygon created by the chord line and the Block Group boundaries that lie outside the ring.

The segment area is subtracted from the sub-polygon area to determine the area of the sub-polygon outside the ring. The area outside the ring is then subtracted from the area of the entire polygon to arrive at the inside area. This inside area is then divided by the tract's total area to determine the percentage of area within the ring. This process is repeated for each block group that is intersected by one of the rings. The total area, partial area, and percentage of partial area of those block groups within, or partially within a ring, are held in memory for the report.

On occasion, the algorithm described above is unable to determine the area of the partial area. Within the report program is a "Paint" routine which allows an enclosed shape to be highlighted. Another routine calculates the percentage of highlighted screen pixels to the pixels within the polygon. A manual entry is allowed. Both the "paint" method and manual entry method over ride the calculated method.

CENTRACTS lists, starting on page 4, all Block Groups in State, County, Census Tract, and Block Group ID order that lie within, or partially within, the maximum ring. Each Block Group is identified by a City or Town name and by the Block Group's State, County, Tract and Block Group ID number. Following is the Block Group's 1990 populu tion and house count extracted from the Census Bureau's 1990 STF-1A files.

The next four columns display water source data from the 1990 STF-3A files. The first column is "Units with Public system or private company source of water", followed by "Units with individual well, Drilled, source of water"; "Units with individual well, Dug, source of water" and "Units with Other source of water".

For each ring, CENTRACTS then shows the Block Groups that are within that ring, the Block Group's total area in square miles, the partial area of the Block Group within that ring, and the partial percentage within the ring. The areas of the included Block Group and the partial areas are then totaled.

The last section tallies the demographic data within each ring. The percentage of area for each Block Group is multiplied times the census data for that Block Group and totaled for all Block Group's within the ring. Ring totals are then determined by subtracting the three mile data from the four mile, the two mile from the three mile, one from the two, etc... Population on private wells is calculated using the formula: ((Drilled + Dug Wells) / Households) * Population

Lakewood Township Landfill
Cross & Faraday Streets, Lakewood, NJ

Reference 4 3/10

No.	City	Block Group ID	Blk Grp People	House Holds	Public Water	Drilled Wells	Dug Wells	Other
1	Howell	34025 8112 5	489	170	0	150	12	0
2	Howell	34025 8112 6	397	153	3	122	21	0
3	Howell	34025 8115 5	470	231	91	108	12	0
4	Howell	34025 811302 3	560	208	6	206	6	0
5	Lakewood	34029 7150 1	139	62	8	47	9	0
6	Lakewood	34029 7150 2	589	205	133	44	0	0
7	Lakewood	34029 7150 3	4632	1754	1582	132	29	9
8	Lakewood	34029 7150 4	0	0	0	0	0	0
9	Lakewood	34029 7151 1	639	204	127	57	16	0
10	Lakewood	34029 7152 2	2295	787	802	0	0	0
11	Lakewood	34029 7152 3	1272	392	395	7	7	0
12	Lakewood	34029 7153 1	5049	1804	1815	48	0	0
13	Lakewood	34029 7153 2	715	245	240	0	0	0
14	Lakewood	34029 7153 3	2372	853	799	0	0	0
15	Lakewood	34029 7154 3	2204	744	638	79	12	0
16	Lakewood	34029 7154 4	1589	366	370	0	0	0
17	Lakewood	34029 7154 5	4440	1211	1213	0	0	0
18	Lakewood	34029 7155 2	999	268	214	58	0	0
19	Lakewood	34029 7155 3	1349	443	341	66	15	0
20	Lakewood	34029 7155 4	2368	1003	853	141	26	0
21	Lakewood	34029 7156 1	2615	769	701	56	11	6
22	Lakewood	34029 7157 1	2378	854	769	76	7	6
23	Lakewood	34029 7158 6	2487	773	572	191	22	0
24	Lakewood	34029 7159 2	2189	1807	1802	19	12	0
25	Lakewood	34029 7159 3	2739	1741	1401	242	42	0
26	Lakewood	34029 7160 1	1989	1603	1621	0	0	0
27	Jackson	34029 7170 1	2198	751	716	67	0	0
28	Jackson	34029 7170 4	1750	506	470	0	10	0
29	Jackson	34029 7174 2	1367	664	245	378	33	0
30	Jackson	34029 7174 3	1936	803	381	336	48	14
31	Jackson	34029 7175 1	1142	344	253	79	0	0
32	Jackson	34029 7175 2	6237	2395	2153	236	23	0
33	Jackson	34029 7175 3	1999	742	39	650	41	6
34	Manchester	34029 7202 1	1482	1078	485	504	59	92
35	Manchester	34029 7202 2	33	14	6	0	5	0
36	Manchester	34029 7202 3	1864	535	454	66	6	0
37	Manchester	34029 7202 4	2707	1566	1512	0	0	0
38	Manchester	34029 7202 5	2183	1610	1650	0	9	0
39	Manchester	34029 7202 6	3668	1729	1401	314	11	0
40	Manchester	34029 7202 7	1929	987	565	323	22	14
41	Dover	34029 7220 1	1414	685	502	126	22	0
42	Dover	34029 7220 2	3806	1548	1252	295	8	0
43	Dover	34029 7221 1	3451	1314	854	428	32	0
44	Dover	34029 7222 2	536	353	317	26	0	0
	Totals:		86666	36274	29751	5677	588	147

Lakewood Township Landfill
Cross & Faraday Streets, Lakewood, NJ

Reference 4 4/10

City	Census Tract ID		Tract People	House Count	Public Water	Drilled Wells	Dug Wells	Other Wells
Dover	34029 7222	2	536	353	317	26	0	0
Dover	34029 7220	2	3806	1548	1252	295	8	0
Dover	34029 7220	1	1414	685	502	126	22	0
Dover	34029 7221	1	3451	1314	854	428	32	0
	Sub Totals:		9207	3900	2925	875	62	0
Howell	34025 8112	6	397	153	3	122	21	0
Howell	34025 8112	5	489	170	0	150	12	0
Howell	34025 811302	3	560	208	6	206	6	0
Howell	34025 8115	5	470	231	91	108	12	0
	Sub Totals:		1916	762	100	586	51	0
Jackson	34029 7174	2	1367	664	245	378	33	0
Jackson	34029 7170	1	2198	751	716	67	0	0
Jackson	34029 7170	4	1750	506	470	0	10	0
Jackson	34029 7175	3	1999	742	39	650	41	6
Jackson	34029 7175	1	1142	344	253	79	0	0
Jackson	34029 7174	3	1936	803	381	336	48	14
Jackson	34029 7175	2	6237	2395	2153	236	23	0
	Sub Totals:		16629	6205	4257	1746	155	20
Lakewood	34029 7153	2	715	245	240	0	0	0
Lakewood	34029 7153	1	5049	1804	1815	48	0	0
Lakewood	34029 7155	2	999	268	214	58	0	0
Lakewood	34029 7153	3	2372	853	799	0	0	0
Lakewood	34029 7154	3	2204	744	638	79	12	0
Lakewood	34029 7154	4	1589	366	370	0	0	0
Lakewood	34029 7154	5	4440	1211	1213	0	0	0
Lakewood	34029 7158	6	2487	773	572	191	22	0
Lakewood	34029 7159	2	2189	1807	1802	19	12	0
Lakewood	34029 7159	3	2739	1741	1401	242	42	0
Lakewood	34029 7160	1	1989	1603	1621	0	0	0
Lakewood	34029 7150	1	139	62	8	47	9	0
Lakewood	34029 7150	2	589	205	133	44	0	0
Lakewood	34029 7150	3	4632	1754	1582	132	29	9
Lakewood	34029 7150	4	0	0	0	0	0	0
Lakewood	34029 7151	1	639	204	127	57	16	0
Lakewood	34029 7152	2	2295	787	802	0	0	0
Lakewood	34029 7152	3	1272	392	395	7	7	0
Lakewood	34029 7157	1	2378	854	769	76	7	6
Lakewood	34029 7155	4	2368	1003	853	141	26	0
Lakewood	34029 7155	3	1349	443	341	66	15	0
Lakewood	34029 7156	1	2615	769	701	56	11	6
	Sub Totals:		45048	17888	16396	1263	208	21
Manchester	34029 7202	2	33	14	6	0	5	0
Manchester	34029 7202	1	1482	1078	485	504	59	92
Manchester	34029 7202	7	1929	987	565	323	22	14
Manchester	34029 7202	3	1864	535	454	66	6	0
Manchester	34029 7202	4	2707	1566	1512	0	0	0
Manchester	34029 7202	5	2183	1610	1650	0	9	0
Manchester	34029 7202	6	3668	1729	1401	314	11	0

Reference 4 5/10

Sub Totals:	13866	7519	6073	1207	112	106

Lakewood Township Landfill
Cross & Faraday Streets, Lakewood, NJ

Reference 4 6/1

For Radius of 4 Mi., Circle Area = 50.265482

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Howell	34025 81125	1.566324	0.003908	0.25
2	Howell	34025 81126	1.503473	0.519803	34.57
3	Howell	34025 81155	1.686653	0.004736	0.28
4	Howell	34025 8113023	1.549265	1.007457	65.03
5	Lakewood	34029 71501	0.642031	0.144087	22.44
6	Lakewood	34029 71502	1.326178	1.266367	95.49
7	Lakewood	34029 71503	1.657820	0.083138	5.01
8	Lakewood	34029 71504	1.391085	0.737224	53.00
9	Lakewood	34029 71511	0.736105	0.597549	81.18
10	Lakewood	34029 71522	0.404443	0.404443	100.00
11	Lakewood	34029 71523	0.253412	0.253412	100.00
12	Lakewood	34029 71531	0.686334	0.686334	100.00
13	Lakewood	34029 71532	0.099072	0.099072	100.00
14	Lakewood	34029 71533	0.272382	0.272382	100.00
15	Lakewood	34029 71543	1.273424	1.273424	100.00
16	Lakewood	34029 71544	0.637997	0.637997	100.00
17	Lakewood	34029 71545	0.518836	0.518836	100.00
18	Lakewood	34029 71552	0.847025	0.847025	100.00
19	Lakewood	34029 71553	0.817770	0.817770	100.00
20	Lakewood	34029 71554	0.770180	0.770180	100.00
21	Lakewood	34029 71561	0.898228	0.898228	100.00
22	Dover	34029 72222	0.649502	0.015785	2.43
23	Lakewood	34029 71586	4.820492	4.513363	93.63
24	Lakewood	34029 71592	0.995106	0.995106	100.00
25	Lakewood	34029 71593	0.831828	0.831828	100.00
26	Lakewood	34029 71601	1.688475	0.236576	14.01
27	Jackson	34029 71701	0.835657	0.101857	12.19
28	Jackson	34029 71704	0.409069	0.313122	76.55
29	Jackson	34029 71742	8.264054	0.172800	2.09
30	Jackson	34029 71743	10.745174	4.953426	46.10
31	Jackson	34029 71751	2.973821	2.183712	73.43
32	Jackson	34029 71752	2.823955	2.199539	77.89
33	Jackson	34029 71753	4.086238	4.086238	100.00
34	Manchester	34029 72021	1.470959	1.470959	100.00
35	Manchester	34029 72022	1.306980	0.742926	56.84
36	Manchester	34029 72023	2.145602	2.145602	100.00
37	Manchester	34029 72024	0.899926	0.428027	47.56
38	Manchester	34029 72025	0.990473	0.421580	42.56
39	Manchester	34029 72026	1.430415	0.061999	4.33
40	Manchester	34029 72027	2.003051	1.944809	97.09
41	Dover	34029 72201	2.088202	2.088202	100.00
42	Dover	34029 72202	3.373914	2.454616	72.75
43	Dover	34029 72211	4.695536	3.118166	66.41
44	Lakewood	34029 71571	2.999984	2.999984	100.00
	Totals:		82.066452	50.323601	

For Radius of 3 Mi., Circle Area = 28.274334

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius

Reference 4 7/10

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
6	Lakewood	34029 71502	1.326178	0.298456	22.50
8	Lakewood	34029 71504	1.391085	0.047786	3.44
9	Lakewood	34029 71511	0.736105	0.002267	0.31
10	Lakewood	34029 71522	0.404443	0.404443	100.00
11	Lakewood	34029 71523	0.253412	0.063136	24.91
12	Lakewood	34029 71531	0.686334	0.150702	21.96
13	Lakewood	34029 71532	0.099072	0.075416	76.12
14	Lakewood	34029 71533	0.272382	0.272382	100.00
15	Lakewood	34029 71543	1.273424	0.771542	60.59
16	Lakewood	34029 71544	0.637997	0.460919	72.24
17	Lakewood	34029 71545	0.518836	0.518836	100.00
18	Lakewood	34029 71552	0.847025	0.847025	100.00
19	Lakewood	34029 71553	0.817770	0.817770	100.00
20	Lakewood	34029 71554	0.770180	0.770180	100.00
21	Lakewood	34029 71561	0.898228	0.898228	100.00
23	Lakewood	34029 71586	4.820492	3.163478	65.63
24	Lakewood	34029 71592	0.995106	0.627669	63.08
25	Lakewood	34029 71593	0.831828	0.048245	5.80
30	Jackson	34029 71743	10.745174	1.840520	17.13
31	Jackson	34029 71751	2.973821	0.645514	21.71
32	Jackson	34029 71752	2.823955	0.770332	27.28
33	Jackson	34029 71753	4.086238	4.027103	98.55
34	Manchester	34029 72021	1.470959	0.978133	66.50
36	Manchester	34029 72023	2.145602	1.686379	78.60
40	Manchester	34029 72027	2.003051	0.409325	20.44
41	Dover	34029 72201	2.088202	2.088202	100.00
42	Dover	34029 72202	3.373914	1.437199	42.60
43	Dover	34029 72211	4.695536	1.153162	24.56
44	Lakewood	34029 71571	2.999984	2.999984	100.00
	Totals:		56.986336	28.274332	

For Radius of 2 Mi., Circle Area = 12.566371

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
18	Lakewood	34029 71552	0.847025	0.847025	100.00
19	Lakewood	34029 71553	0.817770	0.682000	83.40
20	Lakewood	34029 71554	0.770180	0.436370	56.66
21	Lakewood	34029 71561	0.898228	0.587683	65.43
23	Lakewood	34029 71586	4.820492	1.135999	23.57
24	Lakewood	34029 71592	0.995106	0.028519	2.87
30	Jackson	34029 71743	10.745174	0.338683	3.15
33	Jackson	34029 71753	4.086238	2.546487	62.32
34	Manchester	34029 72021	1.470959	0.227658	15.48
36	Manchester	34029 72023	2.145602	0.468641	21.84
41	Dover	34029 72201	2.088202	1.931825	92.51
42	Dover	34029 72202	3.373914	0.208422	6.18
43	Dover	34029 72211	4.695536	0.074756	1.59
44	Lakewood	34029 71571	2.999984	2.999984	100.00
	Totals:		40.754410	12.514051	

For Radius of 1 Mi., Circle Area = 3.141593

Lakewood Township Landfill
Cross & Faraday Streets, Lakewood, NJ

Reference 4 8/10

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
18	Lakewood	34029 71552	0.847025	0.169667	20.03
21	Lakewood	34029 71561	0.898228	0.000572	0.06
33	Jackson	34029 71753	4.086238	0.441126	10.80
41	Dover	34029 72201	2.088202	0.311409	14.91
44	Lakewood	34029 71571	2.999984	2.218818	73.96
	Totals:		10.919677	3.141593	

For Radius of .5 Mi., Circle Area = 0.785398

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
44	Lakewood	34029 71571	2.999984	0.785398	26.18
	Totals:		2.999984	0.785398	

For Radius of .25 Mi., Circle Area = 0.196350

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
44	Lakewood	34029 71571	2.999984	0.196350	6.55
	Totals:		2.999984	0.196350	

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---- Within Ring: .5 Mile(s) and .25 Mile(s) ----

Population:	466.92
Households:	167.68
Drilled Wells:	14.92
Dug Wells:	1.37
Other Wells:	1.18

** Population On Private Wells: 45.38

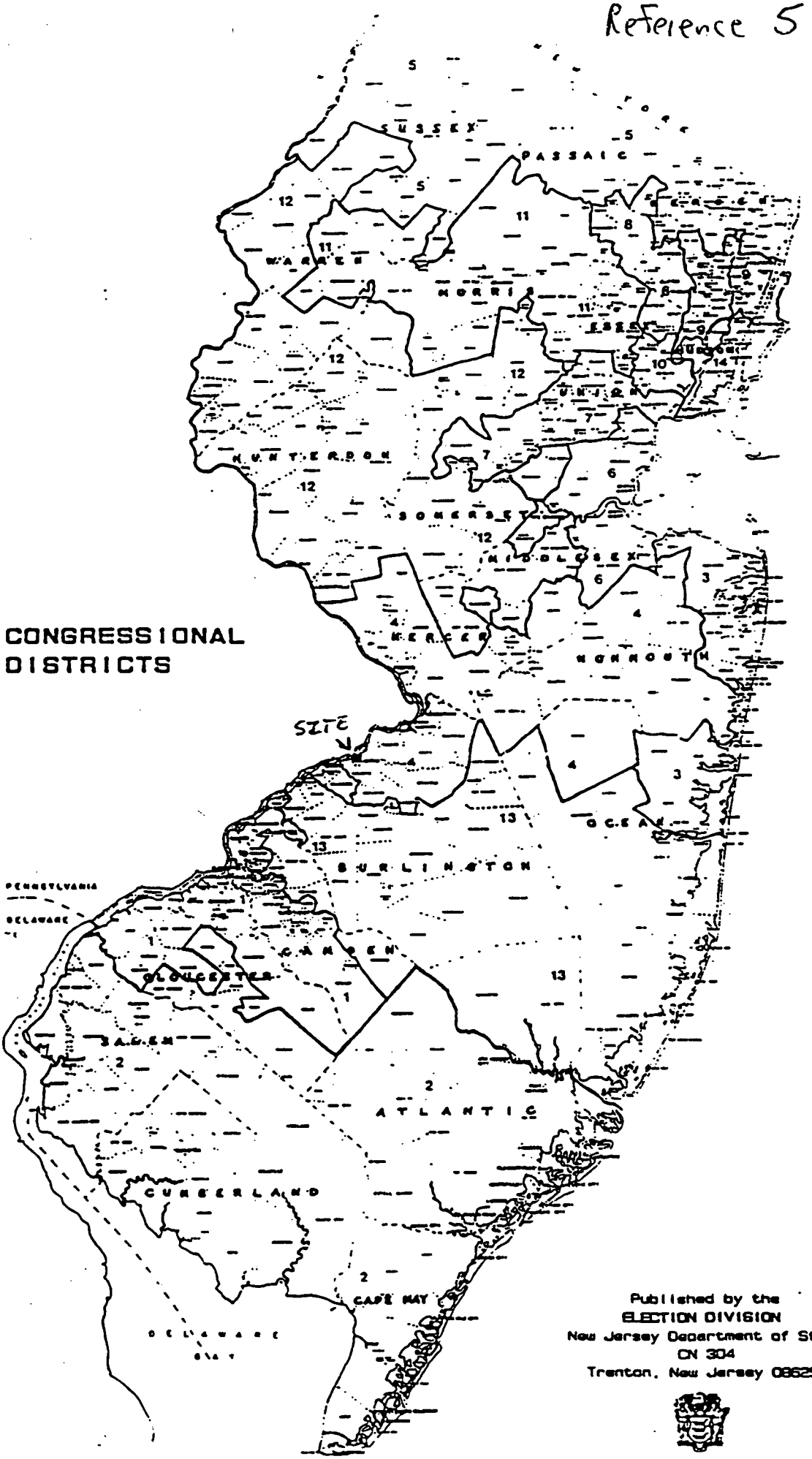
---- Within Ring: .25 Mile(s) and 0 Mile(s) ----

Population:	155.64
Households:	55.89
Drilled Wells:	4.97
Dug Wells:	0.46
Other Wells:	0.39

** Population On Private Wells: 15.13

** Total Population On Private Wells: 10662.88

Reference 5 1/2



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New Jersey Department of State
CN 304
Trenton, New Jersey 08625

Thomas H. Kean
Governor

Jane Burgio
Secretary of State

CONGRESSIONAL DISTRICTS

Reference 5 2/2

DISTRICT ONE: Part of Burlington County (Maple Shade twp., Palmyra borough, Riverton borough.. Part of Camden County (Audubon Park borough, Barrington borough, Bellmawr borough, Berlin borough, Berlin twp.. Brooklawn borough, Camden City, Chesilhurst borough, Clementon borough, Collingswood borough, Gibbsboro borough, Gloucester City.. Gloucester twp.. Haddon twp.. Hi-Nella borough, Laurel Springs borough, Lawnside borough, Lindenwold borough, Magnolia borough, Mount Ephraim borough, Oaklyn Borough, Pennsauken twp.. Pine Hill Borough, Pine Valley borough, Runnemede borough, Somerdale borough, Stratford Borough, Tavistock borough, Winslow twp. and Woodlynne borough;, and Part of Gloucester County (Clayton Borough, Deptford twp.. East Greenwich twp.. Greenwich twp.. Harrison twp.. Logan twp.. Monroe twp.. National Park Borough, Paulsboro Borough, Swedesboro Borough, Washington twp.. Wenonah Borough, West Deptford twp.. Westville Borough, Woodbury City, Woodbury Hts. Borough and Wolfert twp...

DISTRICT TWO: Atlantic County, Cape May County, Cumberland County, Salem County and Part of Gloucester County (Elk twp.. Franklin twp.. Glassboro Borough, Mantua twp.. Newfield Borough, Pitman Borough and South Harrison twp...

DISTRICT THREE: Part Of Monmouth County (Allenhurst Borough, Asbury Park City, Atlantic Highlands, Borough, Avon-by-the-Sea Borough, Belmar Borough, Bradley Beach Borough, Deal Borough, Eatontown Borough, Fair Haven Borough, Harlet twp.. Highlands Borough, Interlaken Borough, Keansburg Borough, Keyport Borough, Little Silver Borough, Loch Arbour village, Long Branch City, Manasquan Borough, Middletown twp.. Monmouth Beach Bore, Neptune City Borough, Neptune twp.. Oceanport Borough, Ocean twp.. Red Bank Borough, Rumson Borough, Sea Bright Borough, Sea Girt Borough, Shrewsbury Borough, Shrewsbury twp.. Spring Lake Borough, Spring Lake Heights Borough, South Belmar Borough, Tinton Falls Borough, Union Beach Borough and West Long Branch Borough; and Part of Ocean County (Bay Head Borough, Brick twp.. Dover twp.. Island Heights Borough, Lakewood twp.. Lavallette Borough, Mantoloking Borough, Point Pleasant Beach Borough, Point Pleasant Borough, Seaside Heights Borough and South Toms River Borough;.

DISTRICT FOUR: Part of Burlington County (Bordentown City, Bordentown twp.. Burlington City, Burlington twp.. Chesterfield twp.. Cinnaminson twp.. Fieldsboro Borough, Florence twp.. Mansfield twp.. Springfield twp. and Westampton twp.; Part of Mercer County (East Windsor twp.. Ewing twp.. Hamilton twp.. Hightstown Borough, Hopewell Borough, Hopewell twp.. Lawrence twp.. Pennington Borough, Trenton City and Washington twp.. Part of Middlesex County (Jamesburg Borough, Monroe twp. and Plainsboro twp.;, Part of Monmouth County (Allentown Borough, Brielle Borough, Colts Neck twp.. Englishtown Borough, Farmingdale Borough, Freehold Borough, Freehold twp.. Holmdel twp.. Howell twp.. Manalapan twp.. Marlboro twp.. Millstone twp.. Roosevelt Borough, Upper Freehold twp. and Wall twp.;. and Part of Ocean County (Jackson twp.;.

DISTRICT FIVE: Part of Bergen County (Allendale Borough, Alpine Borough, Bergenfield Borough, Closter Borough, Cresskill Borough, Demarest Borough, Dumont Borough, Emerson Borough, Glen Rock Borough, Harrington Park Borough, Haworth Borough, Hillsdale Borough, Ho-Ho-Kus Borough, Norwood twp.. Midland Park Borough, Montvale Borough, Northvale Borough, Norwood Borough, Oakland Borough, Old Tappan Borough, Oradell Borough, Paramus Borough, Park Ridge Borough, Ramsey Borough, Ridgewood Village, River Vale twp.. Rochelle Park twp.. Rockleigh Borough, Saddle River Borough, Tenafly Borough, Upper Saddle River Borough, Waldwick Borough, Washington twp.. Westwood Borough, Woodcliff Lake Borough and Wyckoff twp.;. Part of Passaic County (Bloomingdale Borough, Haledon Borough, Hawthorne Borough, North Haledon Borough, Ringwood Borough, Wanaque Borough and West Milford twp.;. and Part of Sussex County (Andover Borough, Andover twp.. Branchville Borough, Frankford twp.. Franklin Borough, Fredon twp.. Hamburg Borough, Hardyston twp.. Hopatcong Borough, Lafayette twp.. Montague twp.. Newton town, Ogdensburg Borough, Sandyston twp.. Sparta twp.. Stanhope Borough, Sussex Borough, Vernon twp.. Wallpack twp. and Wantage twp.;.

DISTRICT SIX: Part of Middlesex County (Carteret Borough, Edison twp.. Highland Park Borough, Metuchen Borough, New Brunswick City, North Brunswick twp.. Old Bridge twp.. Perth Amboy City, Sayreville Borough, South Amboy City, South River Borough and Woodbridge twp.;. Part of Monmouth County (Aberdeen twp. and Matawan Borough;. and Part of Union County (Linden City, Rahway City and Roselle Borough;.

DISTRICT SEVEN: Part of Essex County (Millburn twp.;. Part of Middlesex County (Dunellen Borough and Middlesex Borough), Part of Somerset County (Bound Brook Borough, Bridgewater twp.. Green Brook twp.. Manville Borough, North Plainfield Borough, Warren twp. and Watchung Borough; and Part of Union County (Berkeley Heights twp.. Clark twp.. Cranford twp.. Elizabeth City, Fanwood Borough, Garwood Borough, Kenilworth Borough, Mountainside Borough, New Providence Borough, Plainfield City, Roselle Park Borough, Scotch Plains twp.. Springfield twp.. Summit City, Union twp.. Westfield Town and Winfield twp.;.

DISTRICT EIGHT: Part of Bergen County (Franklin Lakes Borough), Part of Essex County (Part of Belleville Town, Bloomfield Town, Glen Ridge Borough, Montclair Town and Nutley Town;, Part of Morris County (Riverdale Borough; and Part of Passaic County (Clifton City, Little Falls twp.. Passaic City, Paterson City, Pompton Lakes Borough, Prospect Park Borough, Totowa Borough, Wayne twp. and West Paterson Borough;.

DISTRICT NINE: Part of Bergen County (Bogota Borough, Carlstadt Borough, Cliffside Park Borough, East Rutherford Borough, Edgewater Borough, Elmwood Park Borough, Englewood City, Englewood Cliffs Borough, Fair Lawn Borough, Fairview Borough, Fort Lee Borough, Garfield City, Hackensack City, Hasbrouck Heights Borough, Leonia Borough, Little Ferry Borough, Lodi Borough, Lyndhurst twp.. Maywood Borough, Moonachie Borough, New Milford Borough, North Arlington Borough, Palisades Park Borough, Ridgefield Park Village, River Edge Borough, Rutherford Borough, Saddle Brook twp.. South Hackensack twp.. Teaneck twp.. Teterboro Borough, Wallington Borough and Wood-Ridge Borough; and Part of Hudson County (East Newark Borough, Part of Kearny Town, and Secaucus Town;.

DISTRICT TEN: Part of Essex County (Part of Belleville Town, East Orange City, Irvington Town, Newark City and Orange City) and Part of Union County (Millburn Township;.

DISTRICT ELEVEN: Part of Essex County (Caldwell Borough, Cedar Grove twp.. Essex Fells Borough, Fairfield Borough, Livingston twp.. Maplewood twp.. North Caldwell Borough, Roseland Borough, South Orange Village, Verona Borough, West Caldwell Borough and West Orange Town;, Part of Morris County (Boonton Town, Boonton twp.. Butler Borough, Chatham Borough, Chester Borough, Chester twp.. Denville twp.. Dover Town, East Hanover twp.. Florham Park Borough, Hanover twp.. Jefferson twp.. Kinnelon Borough, Lincoln Park Borough, Madison Borough, Morristown Borough, Mountain Lakes twp.. Mine Hill twp.. Montville twp.. Mountain Lakes Borough, Mount Arlington Borough, Mount Olive twp.. Netcong Borough, Parsippany-Troy Hills twp.. Pequannock twp.. Randolph twp.. Rockaway Borough, Rockaway twp.. Roxbury twp.. Victory Gardens Borough and Wharton Borough;, Part of Sussex County (Byram twp. and Green twp.) and Part of Warren County (Allamuchy twp.. Frelinghuysen twp.. Independence twp. and Liberty twp.;.

DISTRICT TWELVE: Hunterdon County, Part of Mercer County (Princeton Borough, Princeton twp. and West Windsor twp.) Part of Middlesex County (Cranbury twp.. East Brunswick twp.. Helmetta Borough, Milltown Borough, Piscataway twp.. South Brunswick twp.. South Plainfield Borough and Spotswood Borough;. Part of Morris County (Chatham twp.. Harding twp.. Morris Plains Borough, Morristown Town, Morris twp.. Passaic twp. and Washington twp.;. Part of Somerset County (Bedminster twp.. Bernards twp.. Bernardsville Borough, Branchburg twp.. Far Hills Borough, Franklin twp.. Hillsborough twp.. Millstone Borough, Montgomery twp.. Peapack-Gladstone Borough, Raritan Borough, Rocky Hill Borough, Somerville Borough and South Bound Brook Borough;. Part of Sussex County (Hampton twp. and Stillwater twp.) and Part of Warren County (Alpha Borough, Belvidere Town, Blairstown twp.. Franklin twp.. Greenwich twp.. Hackettstown Town, Hardwick twp.. Harmony twp.. Hope twp.. Knowlton twp.. Lopatcong twp.. Mansfield twp.. Oxford twp.. Pahaquarry twp.. Phillipsburg Town, Pohatcong twp.. Washington Borough, Washington twp. and White twp.;.

DISTRICT THIRTEEN: Part of Burlington County (Bass River twp.. Beverly City, Cinnaminson twp.. Delanco twp.. Delran twp.. Edgewater Park twp.. Evesham twp.. Hainesport twp.. Lumberton twp.. Medford Lakes Borough, Medford twp.. Moorestown twp.. Mount Holly twp.. Mount Laurel twp.. New Hanover twp.. North Hanover twp.. Pemberton Borough, Pemberton twp.. Riverside twp.. Shamong twp.. Southampton twp.. Tabernacle twp.. Washington twp.. Willingboro twp.. Woodland twp. and Wrightstown Borough;. Part of Camden County (Audubon Borough, Cherry Hill twp.. Haddonfield Borough, Haddon Heights Borough, Merchantville Borough, Voorhees twp. and Waterford twp.; and Part of Ocean County (Barnegat Light Borough, Barnegat twp.. Beach Haven Borough, Beachwood Borough, Berkeley twp.. Eagleswood twp.. Harvey Cedars Borough, Lacey twp.. Lakehurst Borough, Little Egg Harbor twp.. Long Beach twp.. Manchester twp.. Ocean Gate Borough, Ocean Township, Pine Beach Borough, Plumsted twp.. Seaside Park Borough, Ship Bottom Borough, Stafford twp.. Surf City Borough and Tuckerton Borough).

DISTRICT FOURTEEN: Part of Hudson County (Bayonne City, Guttenberg Town, Harrison Town, Hoboken City, Jersey City, Part of Kearny Town, North Bergen twp.. Union City, Weehawken twp. and West New York Town;.

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CN 304 Trenton, New Jersey 08625

January 1987

REFERENCE NO. 6

CONTENTS

PAGE NO.	REFERENCE	DATE

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3-31-95 Lakewood Township Landfill

Photo Log

Photo	Time	Description
P1	11:02	View of the landfill's larger cell note: large depression to the right is the borrow area used to excavate soil for the cap. The large depression is used for surface water collection.
P2	11:02	Essentially the same view but slightly to the west.
P3	11:03	View of the larger cell and the western perimeter of the site.
P4	11:10	Shows drainage swales that run from the larger landfill cell to the wooded area west of the site.
P5	11:13	View of the all terrain vehicle trail that enters the western boarder of the

3-31-95 Joseph Zy

Reference 6 2/8

	[redacted]	Landfill
P6	11:30	Shows a large drainage swale that has developed on the western boarder of the landfill. Based on the topography it seems that water from the larger cell is running to this swale.
P7	11:33	Shows the access road running between the two cells.
P8	11:24	View of the larger landfill cell.
P9	11:27	View of both landfill cells and the seperation between them.
P10	11:35	View of the gravel pits to the east of the landfill.
P11	11:37	View of the access road around the eastern side of the landfill and the dense wooded area to the east of the landfill.
P12	11:42	View of the two cells and

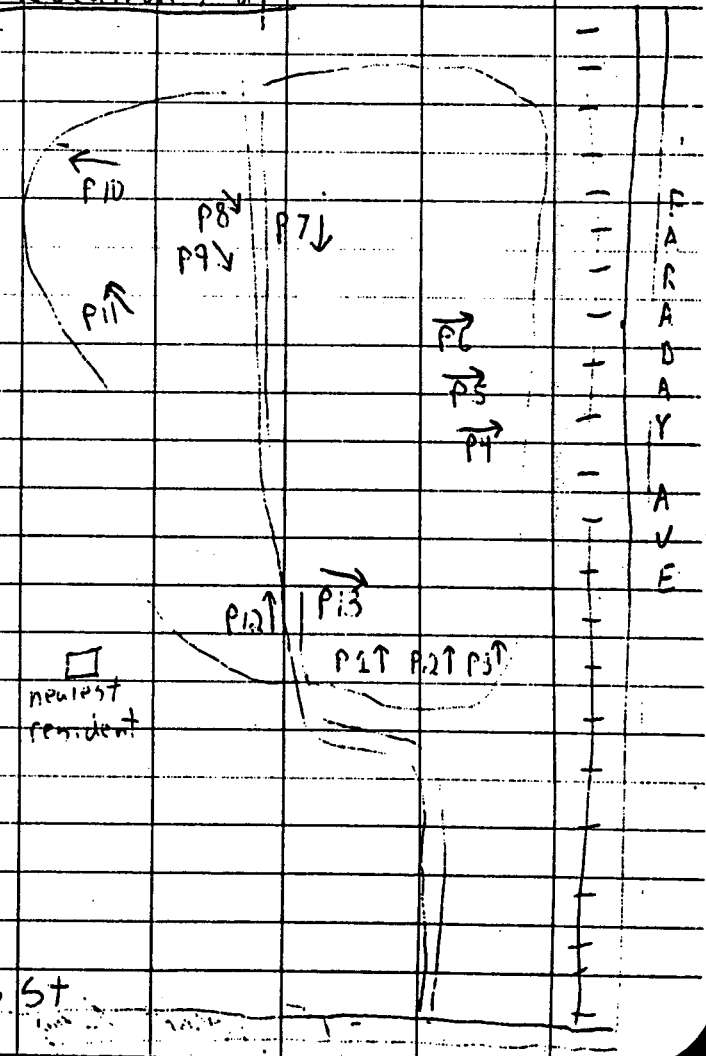
3-31-95 Joseph Gray

3-31-95 Joseph Gray

access road between them.

P13	11:45	View of the dense woods to the north of the site.

Photo Location Map



Joe's Notes:

10:58 Arrive at the site with Lakewood Township's consultant Dave Mynad

We began the site walk through at the access road and walked in a north westerly direction toward the twin tracks.

- The two landfill cells are heavily vegetated
- Dave shows us the northern surface water detention basins he stated that the soils from the basin were used as a cover for the landfill.
- Native soils around the landfill are very fine sands.
- Next we walked in a southerly direction along the western border of the site.
- There are several large diameter swales along the western border of the site that discharge toward the twin tracks. Based on the difference in elevation it appears that surface water from the large cell is discharging to these swales.
- Along the western boarder a trail leads from the twin tracks to the large landfill cell. There are motor cycle tracks on this trail and throughout the landfill.
- there is other evidence of trespassing such as spent shotgun shells, broken clay pigeons (used for target practice with shotguns)
- Dave stated that monitoring wells have been vandalized (shooting of the well casing ect.)
- Next we walked along the southern boarder of the site
- This boarder of the site appears to be higher in elevation than the landfill, there is no evidence surface water from the landfill is leaving the boarder of the site.
- There are several TV sets

3-31-95 Joseph Lang

3-31-95 Joseph Lang

that have been dumped along the border of the site.
- Dave pointed out the southern drainage basin which is much lower in elevation than the landfill and the southern border of the landfill. Based on the elevation differences water from the top of the landfill and from the southern border of the site should flow to this basin.
- Dave showed us a surface water collection system that collects water from the landfill cells and discharges to the northern and southern drainage basins.
- The system consists of swales along the landfill cells that collect surface water and move it via pipes to the northern and southern drainage basins.
- The system works for most of the landfill but areas where

3-31-95 Joseph Ray

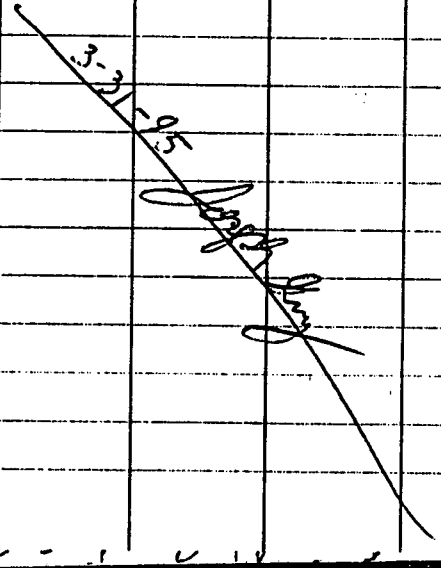
Reference 6 4/8

3-31-95 Joseph Ray

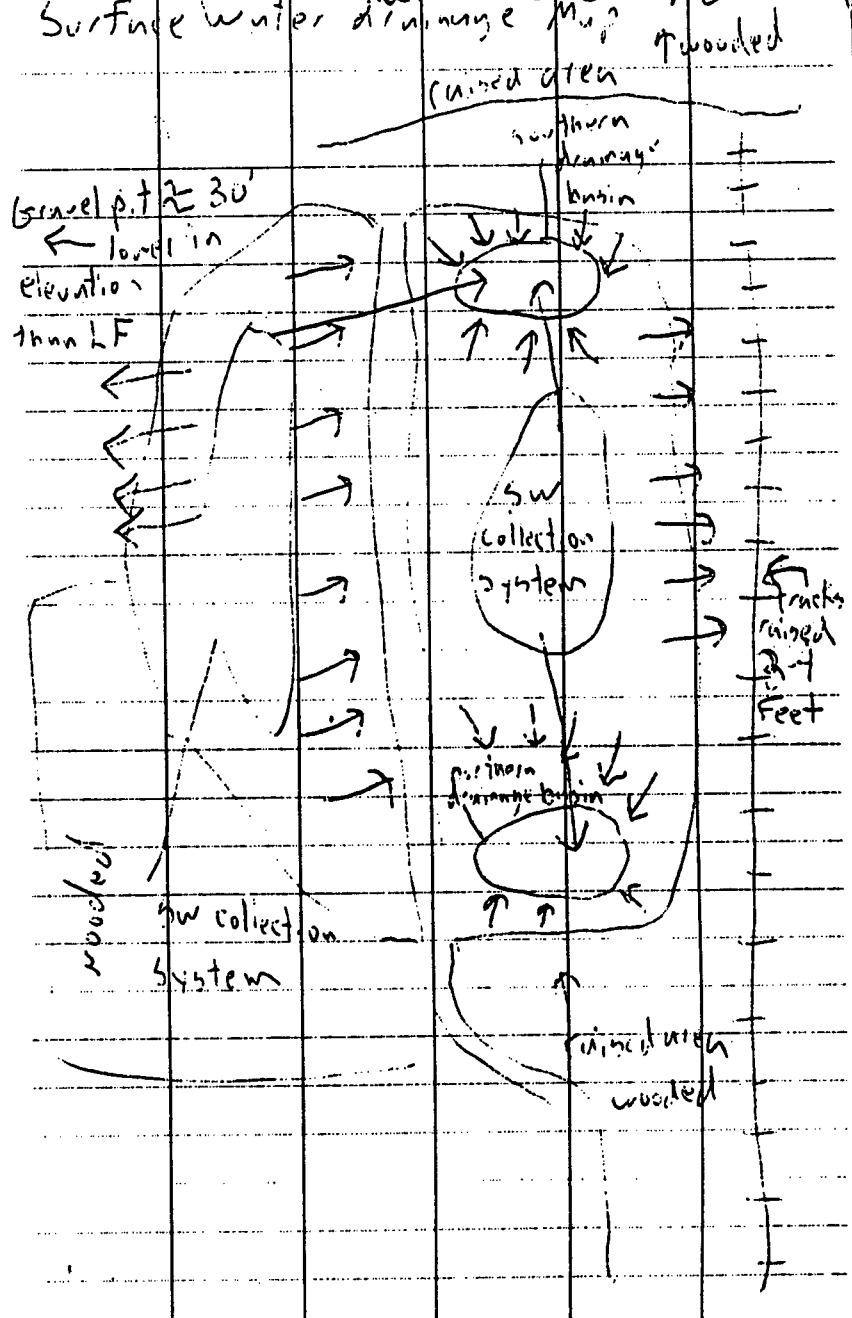
there is evidence (drainage swales) that surface water is leaving the landfill cells are on the west of the landfill and the east of the landfill.
- Next we walked in a northerly direction along the eastern border of the site.
- To the east of the site there is a gravel quarry that is much lower in elevation than the landfill (approximately 30'). The surface water collection system does exist on this side of the landfill however there are drainage swales that exit the top of the landfill and discharge to the gravel pit. (Cont. follow.)
- There is surface water on the other side of the gravel pit, however there would be no way for surface water runoff to reach the stream because the sides of the gravel pit are raised (20-30 feet). The gravel pit is bowl shaped with no exit for surface water.

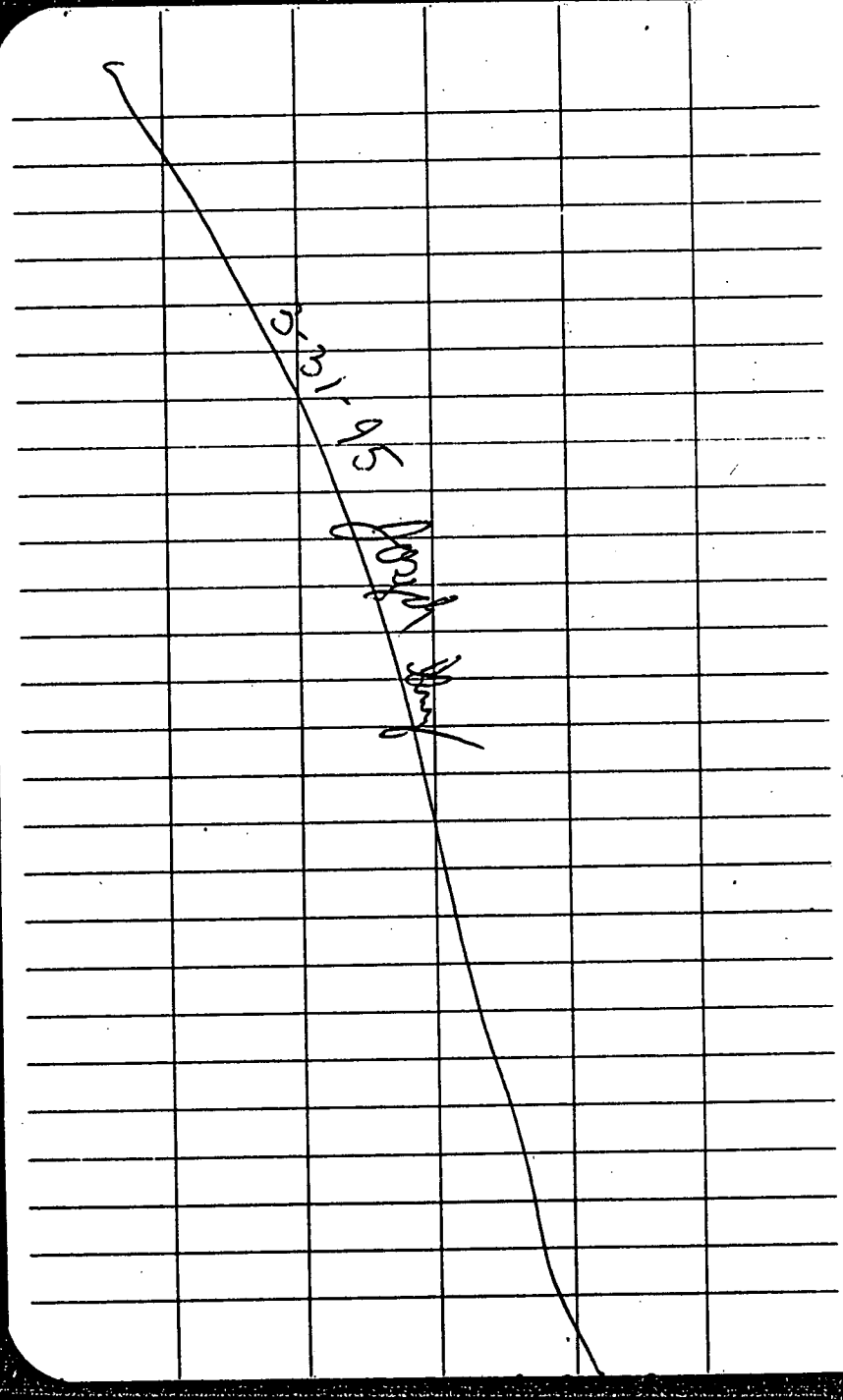
Reference 6 5/8

- Paul stated that there are no workers on-site.
- The vegetation on the cap is very stable and no cracks in the liner were found.
- The only fence on-site is at the access Road, there is no fence around the rest of the site, there are natural barriers (dense wooded areas to the north south and east and train tracks to the west)
- There were no sensitive environments or resources witnessed on-site.



Surface water drainage map





11.56 leave site

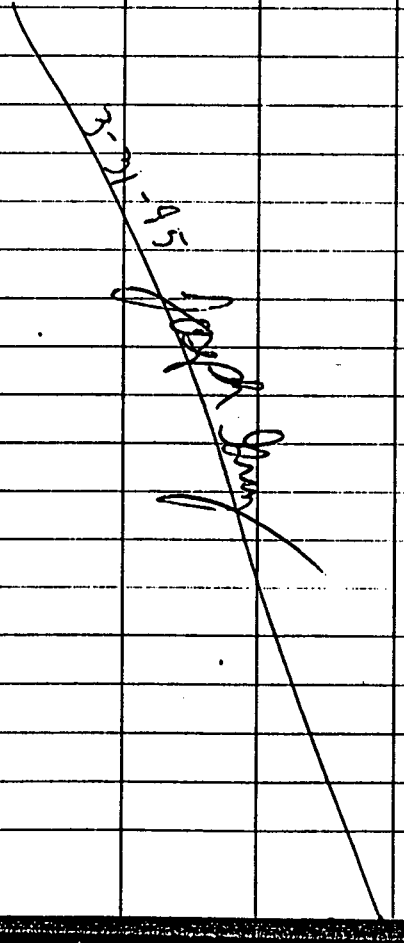
12:00 Interview nearest resident (Harold Reed) located at 47 Cross and Prospect Street)
- Harold stated that he has lived at the residence for 40 years.
- He has one well that is 55 feet deep and serves the three residents at the home. It is used for drinking water as well as for cooking, washing ect.
- Harold stated that the well was tested several years ago but he was not sure on the results or who did the testing.

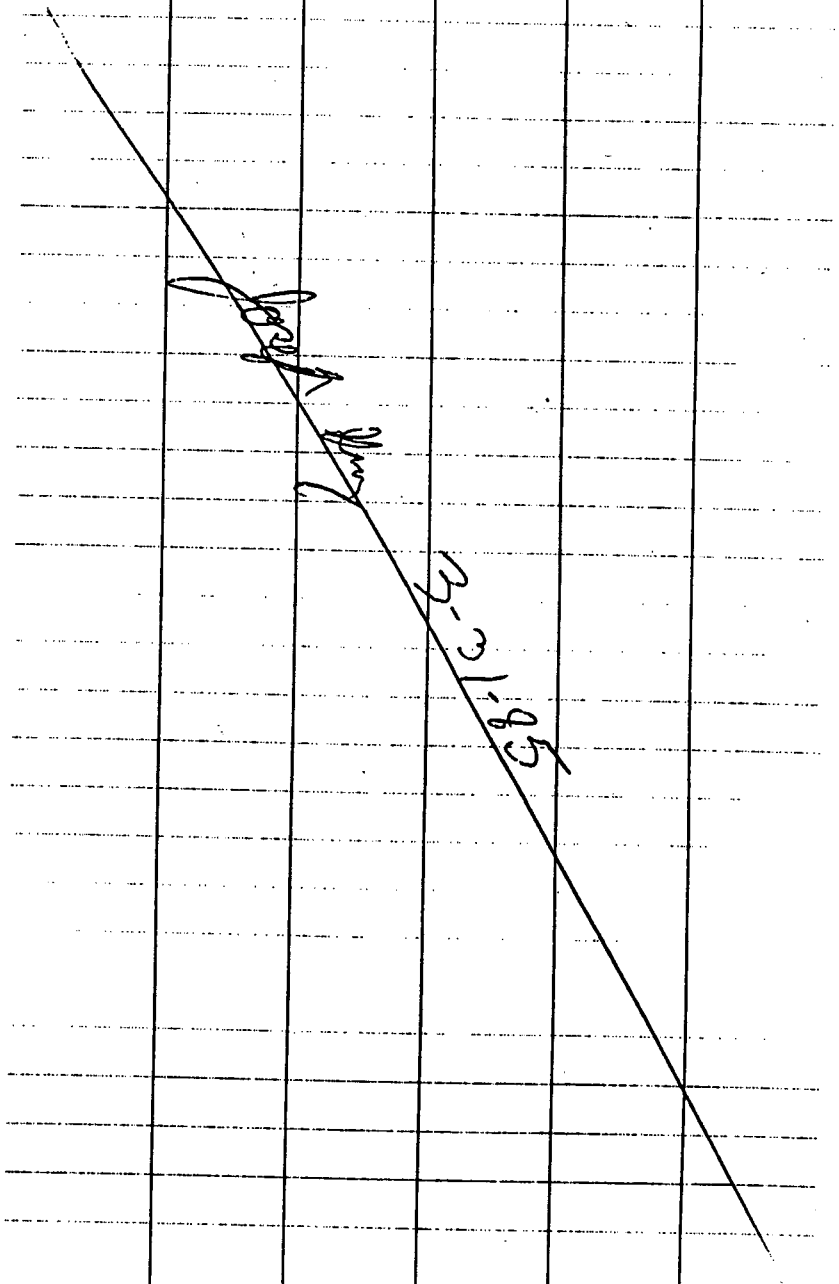
12:10 Interview at Jacksan Ultralights (closest building to the site) Jack Eicholtz stated that there is one well on-site, however it is not used for drinking (bottled water is used) The well is a 4 inch case and Jack said the water

3-31-95 Jeff Lee

Reference 6 7/8

sometimes has a sulfur odor. The well is used for washing and for the sanitary facilities. Jackson Ultra lights is located at the southwest corner of the landfill at Findlay and Whiteseville Road.





Kirti's notes

- The landFill is covered with 2' of on-site soil as per the phase I closure plan approved by NJDEP
- The rainfall over the landFill is drained of into tellures. then to a stormwater piping and eventually to the low spots, ie; basins around the landFill. These basins are created by borrowing soil for the landFill
- D. Mango stated that the Phase II closure plan is with NJDEP which entails placement and synthetic cap and passive gas venting system.
- The site topography around the landFill is such that no stormwater is likely to enter directly into a stream. It is most likely to percolate through the surrounding low spots (basins). Only near the railroad tracks, runoff could go down toward the RR tracks ie. off-site, but not to the surface

3-31-95 Joseph Ley

stream.

- Some of the stormwater pipe inlets were found to be dumped/vandalized and stormwater outlets in the basins were silted up.
- The site is divided into two seperate landFill areas, small, thin, long, triangular landFill at the southeast and a large round landFill at north west (adjacent to RR tracks) property.
- The smallest thin landFill recieved the black liquid waste from a printing company.
- No odors are present at the landFill.
- No leachate was observed
- Soil erosion and exposed trash was witnessed on the western boarder of the site and soil erosion was witnessed on the east side of the site.
- Monitoring wells were observed to be in good condition.

3-31-95 Joseph Ley

REFERENCE NO. 7

Reference 7 1/98 REF

BOARD OF CHOSEN FREEHOLDERS

OCEAN COUNTY, NEW JERSEY

FEASIBILITY ASSESSMENT OF NORTHERN REGIONAL SANITARY LANDFILL SITE

LAKEWOOD-DOVER-JACKSON TWPS., NEW JERSEY

OCTOBER, 1981

WARREN H. WOLF, Freeholder Director

LEONARD T. CONNORS, JR., Freeholder

JOHN C. BARTLETT, Freeholder

H. GEORGE BUCKWALD, Freeholder

DAMIAN MURRAY, Freeholder

Albert J. Mellini

ALBERT J. MELLINI
Professional Engineer - N.J. Lic. No. 24779

Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers

Reference 7 2198

Elson T. Killam Associates, Inc.

27 Bleeker Street, Millburn, New Jersey 07041 Environmental and Hydraulic Engineers

• Telephone: (201) 379-3400 • Telex: 642-057 ETK ASSOC MIBN

October 5, 1981

Board of Chosen Freeholders
County of Ocean
Court House Square
Toms River, New Jersey 08753

Re: Regional Landfill Plan 761

Gentlemen:

Attached hereto is our report detailing the results of the feasibility study we have completed for the northern regional landfill site (Lakewood Municipal Landfill). Our conclusion is that the site is acceptable from an engineering, economic, and environmental standpoint for development as a regional landfill facility.

We recommend that the County proceed with the program of property acquisition as defined herein.

It has been an extreme pleasure working with the Ocean County project planning team during this project and we look forward to working with Ocean County again in the near future.

Very truly yours,

ELSON T. KILLAM ASSOCIATES, INC.

AJM: cp

Enclosure

Albert J. Mellini, P.E., P.P.
Project Manager

Dennis J. Suler
Project Manager

Reference 7 3/98

THE PREPARATION OF THIS REPORT
WAS AIDED BY THE CLOSE
COOPERATION OF THE MEMBERS
OF THE PROJECT PLANNING TEAM

SPECIAL THANKS ARE DUE TO

- Steven L. Pollock, Ocean County Planning Director
- James A. McPherson, SWAC Chairman
- Richard Lane, Ocean County Engineer
- Richard Sullivan, New Jersey First, Inc.
- John Gaston, New Jersey First, Inc.
- Francis Piscal and John Sahradnik, County Counsel's Office

Reference 7 4/98

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Reference 7 6/98

EXECUTIVE SUMMARY

The purpose of this study was to determine the engineering, economic and environmental feasibility of utilizing the existing Lakewood Municipal Landfill as the northern Ocean County regional sanitary landfill. Ocean County's Solid Waste Management Plan calls for the establishment of a regional landfill in both the north and south regions of the County. In addition, a basic premise incorporated in the Plan is that an existing landfill would be acquired and upgraded to serve as the regional facility, if feasible. To that end, a comprehensive evaluation of the Lakewood Landfill was conducted to determine, at a minimum, the following:

a. Was there sufficient acreage on-site to support a regional landfill for the 10 year planning period?
b. Were the costs associated with closure of the existing landfill and construction of the new secure landfill acceptable?
c. Are the environmental impacts associated with the development of a regional landfill at this site acceptable and manageable?

The engineering evaluation centered on a preliminary landfill design of a secure, state-of-the-art sanitary landfill. The proposed landfill is designed to protect the groundwater of Ocean County by using an innovative double synthetic liner system. The landfill liner consists of two layers of Polyvinyl Chloride (PVC) and a soil stabilization fabric. The primary leachate collection liner is 30 mil thick PVC with 36 mil thick Hypalon lining on the side slopes. The secondary "leak detection liner" is 20 mil thick PVC. Both synthetic liners are protected against puncture by a polypropylene fabric embedded in a two foot protective sand

Reference 7 7/98

cover on the primary liner. The liners provide a positive barrier between leachate formed in the refuse and the groundwater.

The proposed regional landfill is modular in design. There are three distinct advantages to a modular landfill. Firstly, since the landfill consists of small 5 acre cells, the cells can be constructed on an "as needed" basis. Large expenditures of capital to line large landfill areas are not necessary, but rather, only sufficient capital to construct one or two cells need be expended during any one to two year time period.

The second advantage of the modular landill is that it allows for the phase-in of resource recovery. In Ocean County, landfills and resource recovery are the needed partnership for solid waste disposal. They are not mutually exclusive, but rather, complement one another as the best, most economical, environmentally sound, long and short range methods of solid waste disposal. As resource recovery facilities are constructed in Ocean County, landfill capacity will be extended. The modular landfill design allows for the construction of only enough capacity as is needed.

The third important advantage to a modular landfill design is that it minimizes the production of leachate. Leachate is rainwater which percolates through the refuse, becomes contaminated, and is trapped by the liner. By using small cells, the amount of rainwater trapped is small. In addition, the cells are rapidly filled to final grade and sealed with clay. This minimizes the amount of rainwater which filters down through the refuse and forms leachate.

The landfill design illustrated in this report incorporates all of the latest techniques to minimize its impact on the environment and on the surrounding land uses while still being economical to construct and

Reference 7 3/98

operate. The northern landfill site is both feasible and desirable from an engineering standpoint to serve as the northern Ocean County regional sanitary landfill.

The economic evaluation consisted of a determination of the cost of constructing and operating the state-of-the-art landfill discussed above. The engineering techniques used are not inexpensive. But, by the same standard, the landfill designed for the northern waste shed protects the environment better than any existing landfill in the County.

The costs of construction included the closure and "capping" of the existing Lakewood landfill; the clearing and grading of the expanded site; and the construction of the liners system, leachate collection, treatment and disposal systems, a truck scale, an administration building, a maintenance building, paved access roads and a basic resource recovery recycling center. The capital costs also included the specialized landfill equipment needed to spread, compact and cover the refuse on a daily basis.

The operating costs included the labor, maintenance and leachate disposal cost incurred during the day-to-day operation of the facility. The amortized annual capital costs and the annual operation and maintenance costs amount to $2,876,500 per year at the northern landfill site. These costs are equivalent to a tipping fee in the $9.00 per ton to $13.25 per ton range, depending on waste loading.

The costs for disposal are high, but this landfill insures the protection of the environment in Ocean County. The costs are acceptable for a regional sanitary landfill, and do not place an undue burden on any one municipality.

The environmental feasibility of the landfill site was

Reference 7 9/98

determined through the investigation of local environmental features, the surrounding land uses and groundwater quality. A detailed investigation of the soils, geology, hydrology, zoning, and population distribution and density was conducted. The impacts of the project on these environemtnal parameters were determined.

The emphasis of the environmental assessment centered on a study of existing groundwater quality. Since the site is an existing landfill, the degree of landfill contamination emanating from the site had to be carefully documented. A number of groundwater monitoring wells were installed surrounding the existing Lakewood site. These wells were sampled periodically and the samples were analyzed by the Ocean County Health Department for a variety of pollutants. The results of the groundwater testing program are included in this report. The work accomplished during this phase of the work did, in fact, identify an area of groundwater contamination leaving the site. Based on the present degree of environmental contamination and the assessment of the impact of the facility on its neighboring land uses, we have concluded that it is acceptable for consideration as a regional sanitary landfill.

The results of the engineer, economic, and environmental investigations are clear. The site is acceptable and well suited to become the northern regional landfill. We recommend that the County begin a program of property acquisition. This program requires the following actions:

Reference 7 10/98

a. A clear, firm commitment by the County to develop the project at this site;

b. Concurrence by the regulatory agencies on a detailed implementation schedule;

c. Additional detailed geo-hydrologic testing;

d. Site negotiation and ultimate acquisition;

e. Final design;

f. Permit acquisition;

g. Construction;

h. Operation.

Assuming final design of the facility commences early in 1982, the facility should be operational in the summer of 1983.

Reference 7 11/98

OB

1.0 DESCRIPTION OF THE PROJECT

1.1 Regional Solid Waste Planning and Project Background

On July 19, 1979, the Ocean County Board of Chosen Freeholders adopted a solid waste management plan. The Plan was modified and re-submitted to the Commissioner of the New Jersey Department of Environmental Protection on July 1, 1980. It was adopted by NJDEP on August 1, 1980.

Briefly, the Plan calls for the acquisition and upgrading of two existing sanitary landfills. The northern site was the Ocean County Landfill Corp. in Manchester Township and the Southern site was Southern Ocean Landfill, Inc. in Ocean Township. The Plan called for the County to purchase these two landfills, close and cap the existing operation and construct new upgraded landfills on the property. The landfills would be engineered to protect the groundwater of Ocean County and would be sized to accept the refuse generated in Ocean County for many years into the future. The Plan also calls for the establishment of resource recovery facilities in Ocean County. One facility, the Dover Township MUA refuse-to-energy plant, is scheduled to be built adjacent to Toms River Chemical Corp. and sell steam to TRC. Additionally, the Ocean County Utilities Authority is currently studying the feasibility of constructing refuse-to-energy plants at each of the regional sewerage treatment plants.

Subsequent to approval of the plan by NJDEP, the County and Manchester Township M.U.A. failed to reach an agreement concerning owning and/or operating the Ocean County Landfill Corp. landfill. Therefore, the County elected to consider the existing Lakewood Municipal Landfill for incorporation in the Plan as the northern regional sanitary landfill.

Reference 7 12/98

One of the first steps in the implementation of the County's solid waste Plan was to conduct a detailed evaluation of the engineering, environmental and economic feasibility of using the two landfills as regional County landfills. The engineering included preliminary engineering design of the regional landfill. This involved the layout of a modular "cell" landfill design, an innovative double synthetic liner, leachate collection, treatment, and disposal systems and sizing of landfill equipment. The environmental work included a study of the eco-systems at the site, an evaluation of groundwater qualty, a study of adjacent land-uses and zoning and an analysis of traffic impact. The economic evaluation included computation of capital and operating costs, debt service costs and a rate averaged tipping fee.

Reference 7 13/98

1.2 Description of Existing Landfill

1.2.1 Site Location

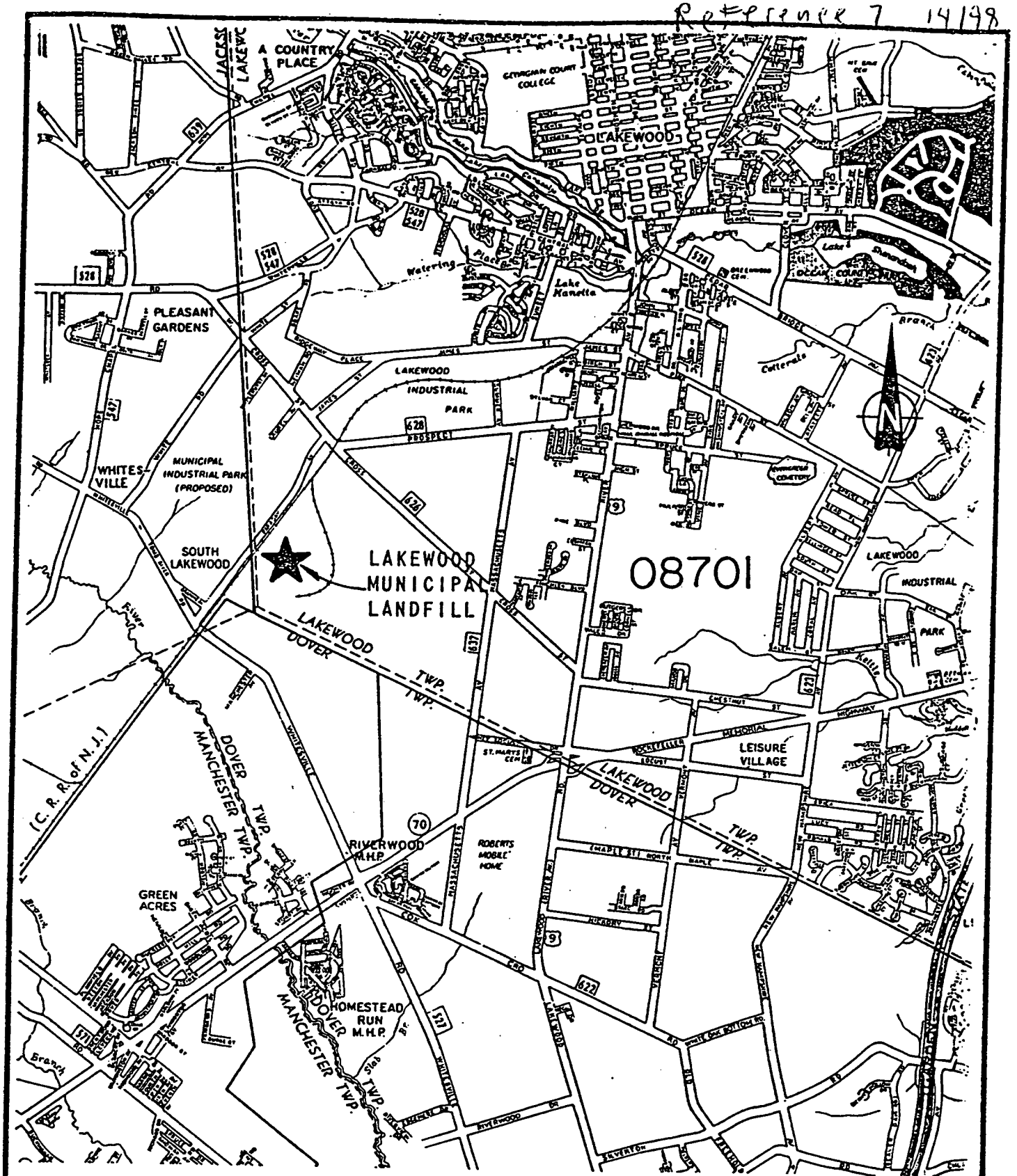
Lakewood Municipal Landfill, (LMLF) is located in Lakewood Township, Ocean County. It is situated on the Lakewood Township, Jackson Township, and Dover Township border in the southwestern section of Lakewood. It is bordered on the north by Cross Street, on the east by Massachusetts Avenue, on the south by Whitesville Road and on the west by Faraday Road and a branch of the C.R.R. of New Jersey. Plate 1 shows LMLF in a regional settting.

Transportation access to the site is good. It is located near State Route 70 and all of the surrounding roads are improved county roads capable of carrying truck traffic. The LMLF is ideally located to service the high population areas of Brick, Dover and Lakewood as well as Manchester and the shore communities on Island Beach.

1.2.2 Site Specific Features

Plate 2 is a U.S.G.S. 7 1/2 minute quadrangle map which shows the site in a more detailed setting. The actual property lines of the existing landfill are shown on the Plate. Access to the existing site is from Cross Street in the northeast sector of the site. The major topographical feature is the property directly east of the landfill. This is a gravel pit which has been substantially mined out. On the site itself, the existing landfilling operation is currently at elevation 130. The landfill is a surface high point. From the landfill, topography drops in a southwesterly direction towards Whitesville Road and the Toms River and southeasterly towards Cross Street and Massachusetts Avenue. The elevation of Whitesville Road is approximately 70 and the elevation of Toms River is at about 50.

Reference 7 14198



LAKEWOOD TOWNSHIP, N.J.

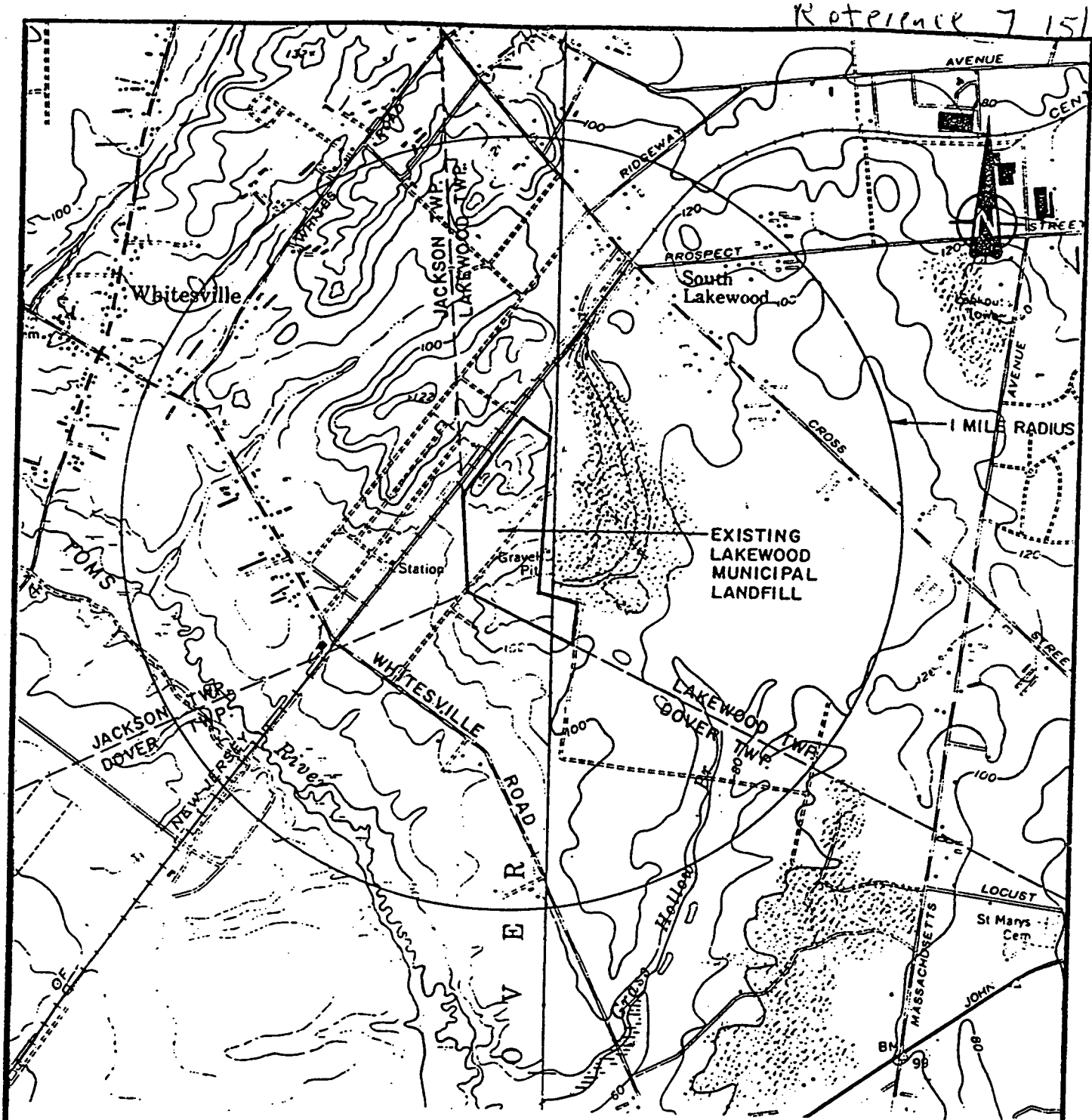
COUNTY OF OCEAN
REGIONAL SANITARY
LANDFILL PLAN
SITE LOCATION
NORTHERN SITE

Scale in Feet (Approx.)
0 2,000 4,000 6,000 8,000 10,000

SOURCE: HAGSTROM CO., N.Y., N.Y.

Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
27 Bleeker Street Millburn, New Jersey 07041

Reference 7 15/98



LAKEWOOD TOWNSHIP, N.J.

SCALE: 1" = 2000'

SOURCE: U.S.G.S. LAKEWOOD AND LAKEHURST
7 1/2 MINUTE 1971 QUADRANGLES

COUNTY OF OCEAN
REGIONAL SANITARY
LANDFILL PLAN
LOCATION PLAN
NORTHERN SITE

Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
77 Bleecker Street Millburn, New Jersey 07041

Reference 7/16/98

Also shown on the U.S.G.S. map is the area within a one mile radius of the site. This radius is generally accepted as an area within which impacts are studied. There are several homes within the one mile radius and the impact of the proposed landfill on the homes will be addressed in later portions of this report.

1.2.3 Existing Landfill Operation

Lakewood Municipal Landfill is a municipally owned and operated landfill. It operates under the regulations of the State Department of Environmental Protection and the Board of Public Utilities. The BPU approved tariff schedule requires accept solid waste from any collector-hauler. Currently, the landfill accepts approximately 400 tons per day of solid refuse from communities in northern Ocean County and southern Monmouth County. No liquid wastes are accepted at the site. During April, May and June of 1979, 783, 715 and 836 vehicles, respectively, entered the landfill. Equipment at the site include two front-end loaders, a landfill compactor and trucks used for hauling cover material.

The landfill property encompasses 62 acres of which about 5 acres are currently being landfilled. Approximately 43 acres, of the 62 sites have been previously filled with refuse. The property is located on Block 524, Lots 102, 103, 104 and parts of Lot 101 and 105. The landfill is reportedly open six days per week from 7:30 AM to 4 PM. Table 1 lists the quantities and waste types which have been landfilled at LMLF for the period January 1, 1973, through December 31, 1980. As shown on the Table, solid waste types such as residential, commercial, institutional and bulky clean-up wastes as well as liquid waste types such as sewage sludge and non-hazardous chemical waste have been landfilled on the site.

Reference 7 11/98

TABLE 1
HISTORICAL WASTE FLOW
INTO LAKEWOOD MUNICIPAL LANDFILL

TIME PERIOD	WASTE TYPE	QUANTITY
Jan. 1, 1973 - Dec. 31, 1973	Municipal Waste (1)	24,715 Tons
	Bulky Waste	3,000 Tons
	Construction & Demo.	4,000 Tons
Jan. 1, 1974 - Dec. 31, 1974	Municipal Waste	27,535 Tons
	Dry Sewage Sludge	1,496 Tons
	Bulky Waste	500 Tons
Jan. 1, 1975 - Dec. 31, 1975	Municipal Waste	9,547 Tons
	Bulky Waste	1,872 Tons
	Construction & Demo.	1,000 Tons
	Liquid Sewage Sludge	1,588,800 Gallons
Jan. 1, 1976 - Dec. 31, 1976	Municipal Waste	51,000 C.Y.
	Bulky Waste	25,128 C.Y.
	Liquid Sewage Sludge	1,200,000 Gallons
	Non-Hazardous Chemical Waste Liquids	2,500,000 Gallons
Jan. 1, 1977 - Dec. 31 1977	Municipal Waste	155,730 C.Y.
	Bulky Waste	35,800 C.Y.
	Liquid Sewage Sludge	805,500 Gallons
	Non-Hazardous Chemical Waste Liquids	1,740,000 Gallons
Jan. 1, 1978 - Dec. 31, 1978	Solid Waste	177,415 C.Y.
Jan. 1, 1979 - Dec. 31, 1979	Solid Waste	235,538 C.Y.
Jan. 1, 1980 - Dec. 31, 1980	Solid Waste	369,205 C.Y.
	Liquid Sewage Sludge	121,060 Gallons

(1) Municipal Waste includes residential, commercial, and institutional.

Source: NJDEP - Solid Waste Administration

Reference 7/18/98

1.3 Proposed Project Design

1.3.1 General

The proposed Northern Ocean County Regional Sanitary Landfill will be a secure, state-of-the-art landfill. It will be situated on 227 acres of land in Jackson, Dover and Lakewood Townships. Its preliminary design meets and generally exceeds the NJDEP rules and regulations of the Solid Waste Administration. In addition, all applicable regulations of the Federal Resource Conservation and Recovery Act (RCRA) are met. Such specific items as protection of the groundwater, collection and treatment of leachate, control of vermin, dust, odors, noise, litter, etc. have been addressed and are reported on in this report. The proposed northern regional site includes the existing Lakewood Municipal Landfill and adjacent properties.

1.3.2. Landfill Sizing and Capacity

In order to properly size the northern regional landfill so that it will have sufficient capacity to allow repayment of bonded indebtedness, and to serve Ocean County through the planning period, reasonably accurate solid waste tonnages must be computed. These tonnages must include all residential, commercial, industrial, institutional, clean-up, and other miscellaneous wastes which are generated in Ocean County. The estimates must also consider the increase in waste load which occurs in the summer months.

Much work concerning solid waste quantities in Ocean County has been done in the past by other consultants. Previous estimates have been reviewed and are considered generally valid, however, actual 1980 census data has been substituted for estimated 1980 data which was used. Using the 1980 base populations, new 1980 weighted populations were computed to

Reference 7 19/98

TABLE 2
MUNICIPAL POPULATIONS IN
NORTHERN WASTE SHED

MUNICIPALITY	1980 CENSUS POPULATION	WEIGHTED POPULATION (1)
Bay Head	1,340	2,236
Berkeley (portion)	9,411	10,265
Brick	53,629	54,989
Dover	64,455	69,367
Island Heights	1,575	1,830
Jackson	25,644	27,539
Lakehurst	2,908	3,069
Lakewood	38,464	39,048
Lavallette	2,072	8,404
Manchester	27,987	29,143
Mantoloking	433	792
Plumsted	4,674	4,674
Point Pleasant	17,747	18,382
Point Pleasant Beach	5,415	13,989
Seaside Heights	1,802	12,032
Seaside Park	1,795	7,507
TOTAL	259,351	303,266

(1) Reflects 10 week summer increase

Reference 7 20/98

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TABLE 3
SOLID WASTE FLOW TO
NORTHERN REGIONAL LANDFILL

MUNICIPALITY	ANTICIPATED TONNAGE - ALL EXIST. LANDFILLS CLOSED	ANTICIPATED TONNAGE - ALL EXIST. LANDFILL NOT CLOSED
Bay Head	8 TPD (1)	8 TPD
Berkeley (po. on)	39	39
Brick	218	OCLF(2)
Dover	270	270
Island Heigh	7	OCLF
Jackson	107	107
Lakehurst	12	12
Lakewood	155	155
Lavallette	24	24
Manchester	115	OCLF
Mantoloking	3	3
Plumsted	19	OCLF
Point Pleasant	73	73
Point Pleasant Beach	44	JHJ (3)
Seaside Heights	33	33
Seaside Park	22	22
TOTAL	1149 TPD	746 TPD

(1) TPD = ns Per Day
(2) OCLF = ean County Landfill Corp., Manchester
(3) JHJ = nes H. James Landfill, Brick

Reference 7/21/98

2.0 EXISTING ENVIRONMENT

2.1 Natural Resources

2.1.1 Geology

An understanding of local and site-specific geologic conditions is important in evaluating a landfill site since subsurface conditions together with surface soil characteristics determine the rate, level, and direction of groundwater movements within a given site. The presence and suitability of various aquifers for potable water use is also a consideration in evaluating the impact of a landfill on groundwater.

Ocean County is underlain by many layers of marine sediments which were deposited during a period when ancient oceans covered the County. Through the course of geologic time, glacial events and earth movements caused the sea to advance and retreat over the county many times, resulting in sediment layers of various characteristics. These layers differ widely in their ability to store and transmit groundwaters, the more permeable being known as aquifers, the less permeable known as aquitards. In general, the bedrock platform on which these marine sediments lie drops gently to the southeast. In addition, present topography is relatively flat due to erosion of the unconsolidated material. These two factors result in a wedge of sedimentary beds which dip in a southeasterly direction.

The Cohansey formation is composed of quartz sands, mixed with scattered beds of clay and gravel. In most areas within the County, this formation contains the unconfined water table. The Cohansey covers all but the northwestern portion of Ocean County. It thickens in a southeasterly direction ranging up to 200 feet in total thickness. The

Reference 7/22/98

Cohansey is an important aquifer in this area with many residential and public supply wells tapping this source. It is also vulnerable to pollution from the surface as it is mostly confined and covered with highly permeable sands.

Below the Cohansey lies the Kirkwood Formation. It outcrops in the northwestern portion of the County and beyond its borders in this direction. The Kirkwood is recharged through its outcrop zone with deep recharge moving southeastward. It also recharges via vertical leakage from the overlying Cohansey. The Kirkwood is also important from a water supply standpoint.

Formations above the Cohansey include a series of eroded, fragmentary deposits younger than the Cohansey. These include the Bridgeton gravel, Pennsauken and Cape May formations, and various Holocene deposits.

Formations below the Kirkwood are less important in the context of the present study as they are located at considerable depth and are isolated by aquitards. Deposits older and deeper than the Kirkwood include the Navesink Formation; Red Bank and Hornerstown Sands; Vincentown, Manasquan and Wenonah Formations; Mt. Laurel Sand; Marshalltown, Englishtown, and Merchantville Formations; Woodbury Clay; and, finally, the Raritan and Magothy Formations which are the oldest in the County and overlay bedrock. In Ocean County, bedrock lies at depths of 2,000 to 3,000 feet.

At the Lakewood Site, the Cohansey Sand is exposed as a surface deposit. However, it is quite thin with the Kirkwood exposed at various locations at this site where surface sands have been removed for mining or

Reference 7/23/86

landfilling operations. In this area, the Kirkwood is approximately 60 to 90 feet in thickness. As stated previously, sedimentary beds dip to the southeast. Therefore, without considering topography and water table gradients, deep recharge would tend to migrate from the site in a southeasterly direction toward Dover Township.

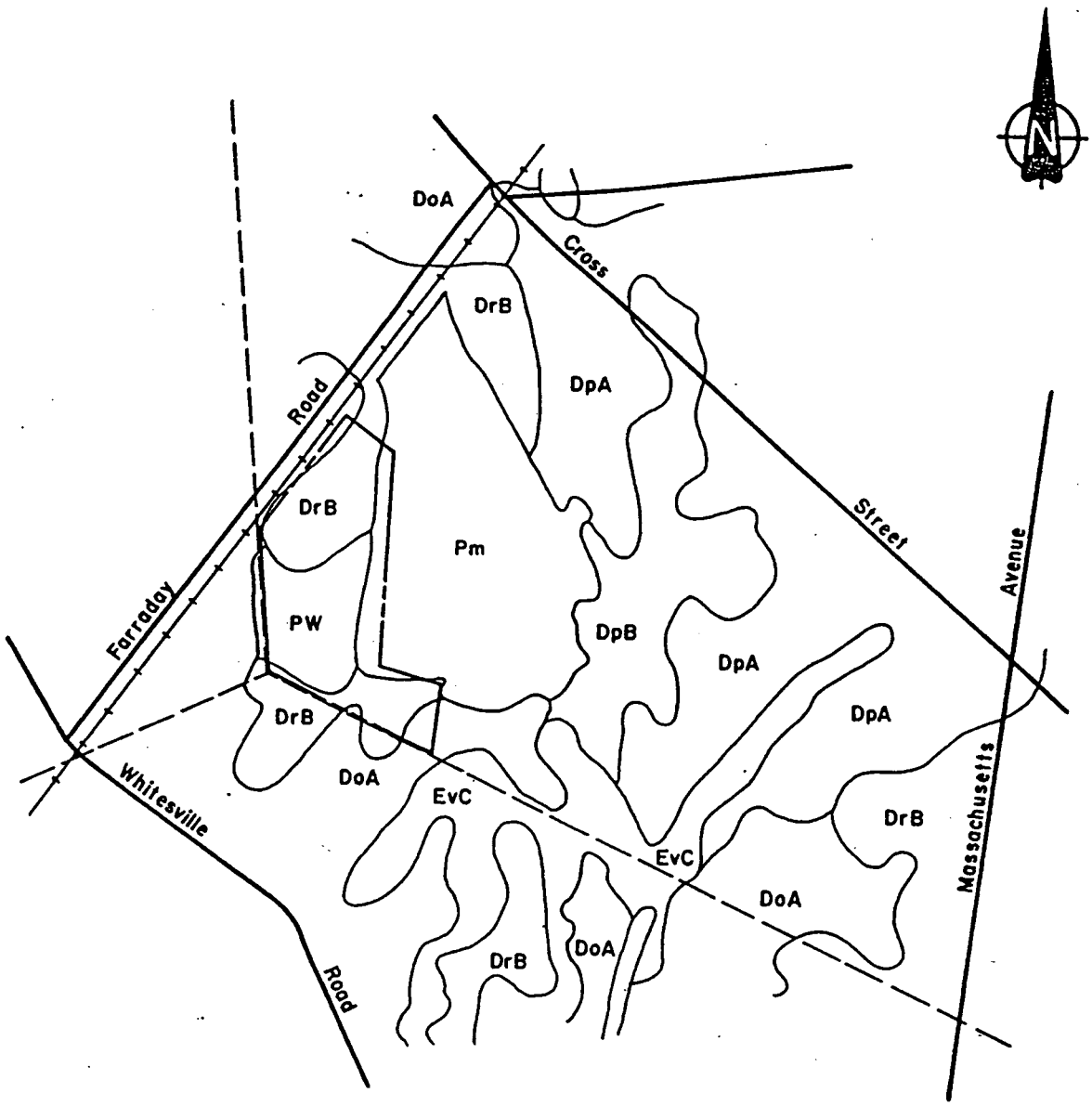
Reference 7/24/88

2.1.2 Soils

Soils are an important consideration when studying the suitablility of a site for landfill operations. Of major importance in considering a soil type for landfill suitability is its permeability and associated water table elevation. The water table information is important since Ocean County is underlain by extensive groundwater reserves and depends on these reserves for potable water supply. Soil permeability is the quality that allows the soil to transmit water. The slower the permeability the less water that moves through the soil in a unit of time. Information regarding soil conditions was obtained from the Soil Conservation Service (SCS) maps. In addition, several soil borings were performed to confirm the information obtained from the SCS and to obtain other site specific information. Plate 5 shows the soil patterns around the Lakewood Landfill site. A description of each soil type follows this map. Boring locations are indicated on drawings 1 through 4 attached to this report. Plate 6 shows the soil profiles obtained from each boring. A brief description of each boring is included in this section.

The soils map includes an outline of the landfill site owned by the municipality at this time. Within this area the soils type designated PW, Psamments, is the area currently being filled and is defined as an area of sandy cover over a landfill operation. DrB, downer gravelly sandy loam is found near the entrance to the property. Presently most of this area is covered by vegetation. To the east of the present fill is the soil type classified PM, which includes pits, sand and gravel. This is a disturbed soil condition that is usually excessively drained with

Reference 7 25/98



REFERENCE:
SOIL CONSERVATION SERVICE

NO SCALE

OCEAN COUNTY BOARD OF FREEHOLDERS
OCEAN COUNTY, NEW JERSEY
SOILS MAP
LAKEWOOD MUNICIPAL LANDFILL

SEPTEMBER, 1981

Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
27 Bleeker Street, Millburn, New Jersey 07041

Reference 7/26/95

BORING NO. PN-1

GROUND SURFACE ELEV. 81.0

1	4-5	MED. DENSE DAMP GRAY BROWN SANDY TOP SOIL 12" BROWN FINE SAND, TRACE M/F GRAVEL	2.5'
2	6-11	DENSE DAMP REDDISH BROWN TO BROWN FINE SAND	
	17-20		8.5'
3	16-11	HARD DAMP BROWN, TRACE RED SANDY CLAY	
	12-19		11.5'
		▼ 12.5'	
4	14-20	DENSE WET BROWN FINE SAND	
	23-23		19'
5	10-13	DENSE WET WHITE FINE SAND	
	16-24		
6	6-12	DENSE WET	
	16-23		27'
		END OF BORING AT 27'	

BORING NO. PN-6

GROUND SURFACE ELEV. 80.8

1	2-4	BROWN FINE SAND MED. DENSE, DAMP	
	6-7		
2	21-26	VERY DENSE, DAMP	
	29-33		
		▼ 9'	
3	14-26	VERY DENSE, WET	
	30-37		13.5'
4	24-27	VERY DENSE WET REDDISH BROWN FINE SAND	
	33-36		18.5'
5	6-19	VERY DENSE WET BROWN FINE SAND	
	34-42		22'
		END OF BORING AT 22'	

BORING NO. PN-7

GROUND SURFACE ELEV. 87.0

1	2-3	LOOSE DAMP BROWN SANDY TOP SOIL 12". BROWN FINE SAND	2.5'
	3-4		
2	5-17	VERY DENSE DAMP REDDISH BROWN TO YELLOWISH BROWN F/C SAND, TRACE CLAY	
	31-32		8'
3	12-17	DENSE DAMP, TAN BROWN FINE, LITTLE MED. SAND	
	22-26		18'
4	16-20	VERY DENSE MOIST BROWN FINE SAND	
	24-35	▼ 18'	18'
5	4-7	MED. DENSE WET YELLOWISH ORANGE BROWN FINE SAND	
	7-10		22.5'
6	6-8	MED. DENSE WET REDDISH BROWN FINE, LITTLE MED. SAND	26'
	6-16	STIFF MOIST WHITE AND RED CLAY LAYER	27.5'
7	11-12	DENSE WET BROWN FINE SAND	
	25-23		32'
		END OF BORING AT 32'	

NOTE: SOIL BORINGS BY KEEGAN TECHNOLOGY AND TESTING ASSOCIATES, INC., NEWARK, N.J.

KEY TO LOG OF BORINGS

(A)	(B)	(C)	(D)
1	15-17		BROWN MED. FINE SAND
	18-21		
5			(E) 3'

(A) DEPTH BELOW GROUND SURFACE

(B) SAMPLE NUMBER

(C) BLOWS ON SAMPLE SPOON PER 6" (15-17 INDICATES 15 BLOWS FROM 0" TO 6" AND 17 BLOWS FROM 6" TO 12")

(D) SOIL IDENTIFICATION

(E) APPROXIMATE DEPTHS OF STARTER BOUNDARIES

▼ GROUND WATER LEVEL

Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
27 Bleeker Street, Millburn, New Jersey 07041

ALBERT J. MELLINI
Professional Engineer - N.J. Lic. No 24779

DESIGNED C.L. DRAWN F.M.D. CHECKED APPROVED DATE

DATE REVISION DESCRIPTION

BOARD OF CHOSEN FREEHOLDERS
OCEAN COUNTY, NEW JERSEY
REGIONAL SANITARY LANDFILL PLAN
SOIL BORING LOGS
NORTHERN LANDFILL SITE

JOB 76101 | NO. 1 | S/O 1 | TOTAL 1

PRINT DATE

Reference 7/27/88

moderately rapid permeability. This area is where the initial proposed expansion is to take place. The Phase II expansion area will involve a Downer gravelly sandy loam soil condition. This soil is of moderate permeability and moderate water capacity. This area also includes Downer loamy sand, DoA, this soil being of moderate permeability and low to moderate water capacity. The soil map shows a soil type designated EvC to the southeast and far east of the present fill. This is an area of Evesboro sand which has rapid permeability.

EvC - Evesboro sand, 5 to 10 percent slopes

This is a sloping, excessively drained soil found on side slopes. Slopes are convex while some small areas are round or oval. The permeability of this soil is rapid. Available water capacity is low. Natural fertility is low and the soil is very acid. Runoff is medium from this loose, sandy soil. Most areas of this soil type are wooded with pitch pine and oak but the soil is not well suited for trees. Seasonally high groundwater levels are found at depths greater than six feet.

DoA - Downer Loamy Sand - 0 to 5 percent slopes

This is a nearly level to gently sloping, well drained soil found on divides and side slopes. Slopes are convex in nature. The permeability of this soil is moderate to moderately rapid. Available water capacity is low to moderate. Runoff is slow. Seasonal high water table is found at depths greater than 6 feet. Natural fertility is low and the soil is very acid. Pine and oak trees may be found growing in this soil type. The soil has a loose sandy surface and is easily worked.

DpA - Downer Sandy Loam, 0 to 2 percent slopes

This is a nearly level well drained soil type normally found on

Reference 7/28/98

divides. Slopes, when present, are convex. The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate and runoff is slow. Seasonally high water table is found at depths greater than 6 feet. Natural fertility of this soil is medium and it is very acid in nature. The soil is very easily worked. Most areas of this soil type are wooded or used for pasture. While this soil is suited for trees, the pasture land is limited by the moderate available water capacity. This soil type has few limitations for urban uses.

DrB - Downer Gravelly Sandy Loam, Gravelly Substratum, 2 to 5 percent slopes

This gently sloping, well drained soil is located on divides and side slopes. Slopes are mostly convex. The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is also moderate. Runoff is slow. Natural fertility of this soil is medium and it is very acid. There is a moderate erosion associated with this soil type but it is generally considered suitable for crops, pasture or woodlot. Most areas of this soil type are wooded with pines and oaks. The soil is generally suitable for most urban uses.

PM - Pits, Sand and Gravel

This is an area of deep, excessively drained to very poorly drained soil material that is predominantly made up of the spoil in a sand and gravel pit during mining and after mining has taken place. Slopes range from nearly level bottoms to vertical walls around the excavation. Most of this area is idle but some is being used for landfilling

Reference 7 29/98

operations. The soil material is dominantly sandy and is 5 to 35 percent gravel. Permeability is moderately rapid to rapid. Available water capacity is low, most areas receive moderate to large amounts of water from areas adjacent to the pits. The water table is between the surface and a depth of more than 5 feet.

PW - Psamments, Waste Substratum

This is the area where approximately 2 feet of sandy fill has been placed over the sanitary landfill. The surface in most places has been smoothed and compacted, and the areas are nearly level or gently sloping. The thickness of the fill material ranges from 2 to 4 feet, and the thickness of the refuse is 10 to 40 feet. The permeability of the areas is moderate or moderately rapid in the upper 2 feet and variable below a depth of 2 feet. Water capacity is low in the fill material.

Since the soil maps prepared for Ocean County by the Soil Conservation District were designed to show general soil characteristics, field investigations and site specific soil borings were performed at the Lakewood Municipal Landfill site. Attached drawings 1 through 4 show the location of each soil boring and the soil profiles have been included on Plate 6. Most of these borings were used to examine soil characteristics and to accomplish the installation of a groundwater monitoring well. These test wells are further discussed in another section. The borings and wells are then numbered from 1 through 9. These borings were completed during the week of May 11, 1981.

In addition a boring was completed through the area previously landfilled. Here special attention was given not to soil types but to depth of fill and water table elevations.

Reference 7 30/98

The test borings and field investigations confirmed the information developed by the SCS. In addition to checking the SCS data, the borings were used to establish water table elevations and to locate any significant sub-surface soil condition, such as a major clay layer. For each soil boring performed, a brief discussion has been prepared and follows.

PN-1

This soil boring is located to the west of the landfill near the adjacent railroad tracks. The elevation of the water table in this location was approximately 12 feet 6 inches below the surface. The first several inches excavated here showed a sandy topsoil composition with dense to fine sand predominating to a depth of 8 feet. Traces of clay were observed from between 8 feet, 6 inches and 11 feet 6 inches. Below the surface of the water table, fine sand material was present to a depth of 27 feet where the boring was completed.

PN-2

Located just south of the area presently being filled, approximately a foot of topsoil was found at the surface. Below this, to a depth of approximately 20 feet, sand is the major constituent of the soil. The surface of the groundwater was 21 feet deep on the date the boring was conducted. A thin clay layer was then observed (approximately 23 feet below the surface) followed by dense, fine sand to a depth of 35 feet, where this boring was concluded.

PN-3

Located south of the landfill and due east of PN-2, PN-3 was drilled in an area previously excavated for sand extraction. Dense fine

Reference 7 31/98

sands were encountered throughout this boring. The water table was observed at 6.5 feet with dense wet sands to a depth of 14 feet. From 14 to 20 feet below ground level, the sand remained fine but was noted as being loose in nature. The test boring was completed 20 feet below the surface.

PN-4

The test boring was performed east of the landfill in the area known as Stavola's pit. PN-4 revealed a groundwater table 8 feet below the surface. Above this, 8 feet of dense, fine sand was observed. A trace of clay was present between 11 and 12 feet. Dense, fine sand was the soil condition to 22 feet below ground level where the test boring was concluded.

PN-5

East of the present landfill and north of PN-4, PN-5 revealed water at a depth of 11.5 feet below the surface. The predominant soil material here was also dense, fine sand. In the first 2.5 feet of excavation, trace amounts of medium fine gravel were found. From the surface to the groundwater at a depth of 16 feet below ground, dense sand was again apparent. From 16 to approximately 17 feet, clay was excavated. This was again replaced by dense fine sand to the conclusion of the test boring 27 feet below the ground level.

PN-6

Far to the east of the landfill in an area that appears to have once been used for sand extraction is the test boring PN-6. The first 9 feet of excavation here uncovered a dense, fine sand until water was encountered 9 feet below the surface. From 9 to 22 feet deep, the only

Reference 7 32198

soil material observed was a dense, wet, fine sand. This soil boring was completed at 22 feet below grade.

PN-7

Located south of PN-3, PN-7 was drilled to a depth 32 feet below ground level. The first 2 feet of excavation here showed sandy topsoil and sand. From 2 to 14 feet, sand with trace amounts of clay was noted. The mid-May 1981 groundwater table was uncovered 18 feet below the surface. Fine sand was again the predominant soil material from 18 to 26 feet. At 26 feet below grade, a clay layer approximately 1 foot thick was observed. Dense, wet, fine sand replaced this clay and continued to a depth of 32 feet at which depth the test boring was completed.

PN-8

This soil boring is located north of the landfill near the road presently used for landfill access. Fine sand again predominated to a depth of 19 feet. Between 3 feet and 12 feet deep, a trace of coarse sand was discovered. Between 19 and 21 feet below grade, dense wet sand and a trace of clay was noted. Below 21 feet; dense, fine, wet sand was common to a depth of 32 feet below the surface where the boring was concluded.

PN-9

North of PN-1 along the railroad, PN-9 showed a groundwater depth 24 feet below grade. The initial excavation at this site included a thin layer of topsoil in the first 10 inches followed by sand to a depth of 19 feet. 19 feet below the surface, a thin clay layer was encountered to be quickly replaced by sand. Below this, dense wet fine sand was observed to a depth of 37 feet where this soil boring was concluded.

Reference 7 33/98

In addition to the soil borings performed, a boring was made through the previously filled garbage to find the distance between the bottom of the fill and the water table. The fill was found to extend 40 feet below the surface. Below the fill, 8 feet of dry sand with sand and mixed fill were found to a depth of 48 below grade. The top surface of the groundwater table was observed 48 feet below the surface. Wet sand was the common soil material to a depth of 60 feet where the soil boring was concluded.

In general, the soil borings showed what could be expected from viewing the soil service maps. The water table was found at considerable depth even though the borings were conducted after a period of very heavy rains. The garbage boring showed approximately 8 feet separated the bottom of the fill material and the water table in that area. Sand was the predominant soil material encountered throughout the boring. Most of the sand observed was fine and dense. Clay seems to occur in isolated lenses and was not observed in any significant amounts above the water table.

In the proposed expansion of the Lakewood Landfill, Phase 1 involves movement to the east where an already disturbed soil condition is present. Permeability in this area is fairly rapid and the water table is relatively close to the surface, since most of the overburden has been previously mined out. The area for Phase II expansion contains soils and ground conditions suitable for a lined landfill operation.

2.1.3 Topography

The topography of the Lakewood site has been extensively modified by landfilling and sand mining operations. In general, areas surrounding the site are relatively flat to gently rolling. Within the site, elevations vary from approximately 90 feet to 125 feet. In general topographic terms, the site lies on a plateau with slopes trending to the southwest toward the Toms River and northeast toward the Metedeconk River. The plateau actually forms a broad flat ridge which lies on a northwest-southeast axis. Both major rivers, which form "valleys" draining the area, lie at an elevation of approximately 50 feet. Plate 2 and drawing 1 through 4 show both area-wide and site specific topographic patterns.

2.1.4 Hydrological Features

An evaluation of groundwater quality and flow patterns were made at the Lakewood site to determine the impact of existing landfilling operations. In order to accomplish this, data was required regarding subsurface soil conditions and groundwater elevations. Since only one monitoring well is present on the site, available data was limited.

Soils data was obtained from the soil boring program previously discussed. When the borings were placed, groundwater elevations were noted and recorded. In order to assess groundwater quality, a series of nine monitoring wells were installed. As an initial screening, the wells were placed in a ring which encircled the landfill so that any contaminant plumes which were migrating away from the site could be intercepted. These wells permitted subsequent groundwater sampling and water table elevation measurements. Groundwater elevations on the site varied between 60 and 70 feet in most cases. However, the highly irregular nature of site topography results in scattered groundwater mounds which make interpretation of small elevation differences difficult. With surface drainage from the site moving toward the Toms River, and a general topographic tilt in that direction, it is likely that groundwaters will move in that direction. The elevation of the Toms River is at approximately 50 feet at its nearest downgradient position, or 10 to 20 feet below the water table elevations on-site.

Groundwater samples were taken from the newly installed monitoring wells, from existing on-site wells, and from selected residential wells in the vicinity of the landfill during the last week in May (1981), and again on June 19, 1981, July 1, 1981, and July 28, 1981.

Reference 7/36/98

Thirty-two different water quality analyses were performed although not all tests were performed on all samples. The parameters tested included a wide range of water quality indicators, conventional pollutants, heavy metals, and volatile organics. With the exception of fluoride, cyanide, mercury, arsenic and selenium, all tests were conducted by the Ocean County Health Department. Samples were tested for mercury at E.T. Killam Associates' laboratory, and the remaining four parameters were tested by Henderson Laboratories, Beechwood, NJ. Appropriate water quality standards for the parameters tested are listed on Table 5. It should be noted that primary standards are established at levels to protect human health. Secondary standards are intended to prevent nuisance conditions in drinking water, such as unpleasant tastes, staining of laundry, etc. Appendix A contains a tabulation of the data which was collected during the sampling program. Data are rounded to an appropriate number of significant figures. Levels of benzene, toluene, ethylbenzene, and xylenes which were either not detectable or were indicated at levels between .0005 and .001 part per million are reported as "less than" .001 part per million. This was done because the reliability of instrument readings in the range of .001 part per million (or one part per billion) is questionable.

Presented below is a discussion of the results generated for each monitoring well. Well locations are shown on Drawings 1 through 4.

EN-1

This is the only pre-existing monitoring well located at the Lakewood site. Total dissolved solids (TDS) found at this location ranged from 39 to 65 parts per million (ppm). TDS is a good overall water

Reference 7 37/38

TABLE 5
GROUNDWATER QUALITY STANDARDS

PARAMETER	PRIMARY STANDARDS	SECONDARY STANDARDS
PH		5-9
Hardness		
Sulfate		250 ppm
TDS		500 ppm
Nitrate-Nitrogen	10.0 ppm	
Ammonia		0.5 ppm
MBAS		0.5 ppm
Phenols		0.3 ppm
BOD		
COD		
Chloride		250 ppm
Odor		
Fluoride		2.0 ppm
Cyanide	0.2 ppm	
Chromium	0.05 ppm	
Mercury	0.002 ppm	
Lead	0.05 ppm	
Iron		0.3 ppm
Manganese		0.05 ppm
Zinc		5.0 ppm
Copper		1.0 ppm
Cadmium	0.01 ppm	
Barium	1.0 ppm	
Silver	0.05 ppm	
Sodium		50 ppm
Arsenic	0.05 ppm	
Selenium	0.01 ppm	
Benzene		
Toluene		
Ethylbenzene		
Xylene		

* Source: D.E.P., GW-2 Standards, Federal Drinking Water Standards

quality indicator as uncontaminated groundwaters in the area will contain TDS levels generally less than 50 ppm and as low as 20 ppm. Therefore, EN-1 with a maximum of 65 ppm of TDS exhibits very little influence on this parameter from the landfill.

Iron was found at levels from 2.0 to 30.6 ppm. Iron is found in Ocean County soils in siginficant amounts. It is frequently a problem in potable water supplies causing taste problems and staining laundry. The presence of leachate in groundwater increases the solubility of iron and can result in very high concentrations. The presence of diluted leachate may be responsible for elevated levels of iron. Manganese is commonly found with iron and is also found at elevated levels where organic contamination exists. Samples taken from EN-1 were found to violate both the secondary Iron and Manganese standards.

Four volatile organic compounds were tested for, including benzene, toluene, ethylbenzene, and xylenes. A low level of .006 ppm of xylene was found on one occasion.

Overall, this well exhibited fairly good water quality for a landfill monitoring well in its location.

Landfill Blockhouse

Total Dissolved Solids were measured at levels which are near background (up to 58 ppm). Only iron and manganese exceeded the standard. Overall, water quality was fairly good.

PN-1

This well lies along the railroad tracks which border the landfill. TDS was measured at levels to a maximum of 49 ppm. Only Iron

Reference 7 39/98

exceeded water quality standards. Overall, water quality was judged good for a landfill monitoring well.

PN-2

This well lies several hundred feet from the landfill in a downgradient direction. That is, it lies between the fill and the Toms River in the direction which groundwaters were expected to move. Predictably, this well showed the greatest effect from the landfill. TDS ranged from 360 to 533 ppm, well above background and slightly above the 500 ppm secondary standard. Manganese and iron (in particular) levels were significantly elevated, with iron present at a concentration of 364 ppm. Sodium was found to exceed the secondary standard of 50 ppm by a slight amount. Chromium was also found at levels above background. Tests on all three dates showed positive and significant results for the four volatile compounds tested. Ethylbenzene and xylenes were found at levels higher than benzene and toluene. On two of the three sampling dates, the concentration of these four compounds totalled approximately .5 ppm. Future tests for other organics are indicated by these results.

Overall, the results for PN-2 indicate the presence of leachate as would be expected from an unlined landfill.

PN-3

PN-3 is located near PN-2 and is also downgradient from the landfill. Mechanical difficulties with this well required its removal after the first sampling date. From a limited sample, an elevated TDS value of 369 ppm was obtained, also indicating the presence of diluted leachate.

Reference 7
DB 40/98

PN-4

This well is located in the area known as Stavola's pit, which is adjacent to the landfill. PN-4 is located approximately 300 feet from the fill. TDS levels found on two sampling dates were 27 and 37 ppm, or near background. Manganese was not detected but iron exceeded the standard to a maximum of 9.2 ppm. For a landfill monitoring well, water quality was good.

PN-5

This well is also located in Stavola's pit approximately 400 feet from the fill. TDS averaged 55 ppm, but iron was quite high at 198 ppm on one date but 13.9 ppm on another. Other parameters indicated fairly good water quality.

PN-6

This well is located in Stavola's pit but is over 2,000 feet from the fill. TDS was measured to a maximum of 67 ppm, slighly above background. Manganese exceeded the standard by a small margin on one occasion, but iron was present in high concentrations (up to 49 ppm). Other parameters which might indicate organic contamination were present at reasonably low levels.

PN-7

This well is located south of the fill at a distance of approximately 900 feet. TDS was measured to a maximum of 53 ppm, slightly above standard. Iron exceeded the standard with values up to 10 ppm. Lead also exceeded the standard on two of three occasions with a high reading of 1.1 ppm. A positive reading was also noted for xylene in two samples with levels of .004 and .014 ppm.

Reference 7 41/98

PN-8

This well is located along the access road to the fill at a distance of approximately 300 feet. TDS was measured up to 42 ppm, which is near background. Iron and manganese were above standard, with iron at a maximum of 69 ppm and manganese at .21 ppm. Xylene was found at a level of .009 ppm in one sample. Other indicators of organic contamination were found at low levels.

PN-9

This well was also located adjacent to the railroad tracks which border the landfill. TDS was measured at 47 and 66 ppm. Iron was the only parameter to exceed the standard.

In addition to the on-site wells tested, a number of residential wells were tested. These included the following:

Lehman

The Lehman residence is located on Whitesville Road. This well is shallow in depth (approximately 25 feet) and is located approximately 2500 feet downgradient from the landfill. TDS was elevated, with levels between 250 and 300 ppm. Interpretation of these results is complicated by the fact that a water softener has been intalled by the homeowner. Iron, which was present at relatively low levels, may be significantly higher in the raw water supply. Sodium was present at an elevated level, but this (and possibly TDS) may be partially accounted for by the softening device. Nonetheless, the water sample exhibited a marked odor, and trace amounts of xylene (.004 ppm) were found in one sample. This residence is downgradient from the landfill, in the direction of and beyond PN-2.

Reference 7-22/98

Frady

The Frady residence is near Lehman and is also downgradient from the landfill. TDS levels were much lower at 52 and 60 ppm. Iron and manganese exceeded the standard, but were substantially lower than other wells near the landfill. Trace amounts of Ethylbenzene and xylene (.002 ppm each) were found in one sample. Mercury was also found at the standard.

Pierson

This is another residence on Whitesville Road which lies in a downgradient direction from the landfill. TDS was measured at 42 ppm. Only manganese violated the standard.

Buzby

The Buzby residence is located on Faraday Road and is fairly close to the landfill. TDS was mesured at 27 and 37 ppm and all reported parameters met the standard.

South Jersey Aluminum

This well is situated near the corner of Whitesville and Faraday Road. Iron was above standard at 1 ppm, but other parameters were within acceptable limits.

Werbler

The Werbler residence is located on Cross Street in Lakewood. TDS was elevated in two samplings at 162 and 164 ppm. However, this well also exhibited high levels of nitrate, exceeding the standard in one case. Such levels were not evident in near field monitoring wells, hence this is likely to be an unrelated problem possibly caused by a septic tank or agricultural runoff.

Reference 7
DB 43/98

Lombardi

This well, near Massachusetts Avenue, exhibited generally good water quality except for an elevated level of copper. This is likely the result of corrosion of copper piping in the home from somewhat acid groundwaters.

Sitton Septic

This well is located near the access road to the landfill, off Cross Street. TDS was noted to be somewhat elevated, and iron exceeded the standard. Whether the elevated TDS is a result of the landfill is uncertain but possible. Except for the slightly elevated iron level, water quality at this location was generally good.

Four other homeowners along Whitesville Road were sampled, but were further removed from the landfill than the Frady, Lehman and Pierson residences discussed previously. Except for iron, these wells exhibited good water quality with no indications of any effect from the landfill.

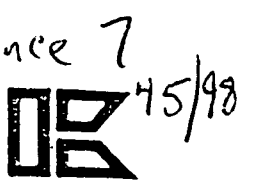
In terms of overall groundwater conditions, the work done and data developed to date indicate that the landfill is currently having an impact on adjacent groundwaters. Most significant is the migration of contaminants from the fill in the direction of PN-2 and Whitesville Road. While PN-2 is significantly affected by the landfill, a comparison between this well and downgradient wells on Whitesville Road shows contaminant levels much lower at the latter locations. Data for other landfill wells shows varying indications of groundwater impact, as evidenced by elevated iron levels, traces of volatile organics, and low levels of lead in one case. Adjacent homeowners generally have acceptable water quality (except for iron) however, several samples show readings for certain parameters which are above background but within standard.

Reference 7
DB 4/4/98

These data point to the groundwater contamination potential that an unlined facility has in a location such as this. Since the garbage boring indicated that solid waste was above the water table, this facility should be amenable to mitigation of the existing groundwater effects by appropriate closure techniques.

No effect from the landfill can be determined in examining data for the Toms River. However, the River is quite distant from the landfill. This would make such an effect very difficult, if not impossible, to measure.

Reference 7



2.1.5. Air Quality/Climate

In Ocean County, ambient air quality is defined in terms of four major pollutants. The only air monitoring station in the County that is capable of measuring more than particulates is located in Toms River. This station is located in downtown Toms River and is capable of measuring carbon monoxide, sulfur dioxide, smoke shade, and total suspended particulates. In addition to this station, there are several samplers county-wide that are used to collect information regarding levels of particulates. However, overall air quality information for Ocean County is limited by the lack of sampling sites and limitations on pollutants monitored.

Important in a discussion of Air Quality are the standards established for the various contaminants. In most cases standards are established for each contaminant monitored. The primary standards established by the Department of Environmental Protection are intended to protect public health, while secondary standards are levels of air quality, with a safety factor, that are intended to protect the public welfare from any known or adverse effects. Defined sources of air pollution include the point source, line source and area source categories. A point source is a single major emitter that can be identified with a specific location. Typical of a point source is a large industrial facility. The line or "mobile" source is generally a major highway or transportation link. Accordingly, the major emitter from a line source is the motor vehicle. The area source includes commercial, industrial, residential and highway emitters which are too small individually to be considered line or point sources.

Reference 7 4/6/92

The following is a brief discussion of each pollutant measured in Toms River, the standards relating to each and the levels recorded in Toms River for the sample year 1980.

Particulates

Particulates originate from numerous sources, with the primary being fossil fuel combustion. The primary federal standard for particulate levels is 260 ug/m^3, while the secondary standard is 150 ug/m^3, both of these standards being for 24 hour average levels. In the 1980 sample year, neither the 24 hour primary nor secondary standard was violated in Toms River. The highest recorded level was 91 ug/m^3 on June 2 in Toms River. There is also a particulate monitoring station in Jackson Township. Reports from this station indicate the highest recorded 1980 level occurred on December 24th but was only 82 ug/m^3.

Sulfur Dioxide

Sulfur dioxide originates predominantly from fuel combustion and metal smelting. Sulfur dioxide may react in the atmosphere to form substances which are corrosive and harmful to human health. Concentrations of this pollutant can be critical for both long and short term exposures. The standards established for sulfur dioxide include a 3 hour secondary level of 0.5 parts per million (ppm), a 24 hour primary of 0.14 ppm, a 24 hour secondary level of 0.10 ppm, a 12 month primary of 0.03 ppm, and a 12 month secondary standard of 0.02 ppm. The station in Toms River is the only location where Ocean County's sulfur dioxide levels have been measured. The concentrations detected at Toms River have been well below any standard. The monthly average sulfur dioxide concentration recorded in 1980 was 0.006 ppm.

Reference 7
DE 47/98

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless gas that has a background concentration of approximately 1 ppm. When CO levels approach several hundred ppm, it can affect the human system causing dizziness, loss of mental acuity, and eventually death. The major source of CO is incomplete fuel combustion from the internal combustion engine. Standards (primary and secondary) have been established for an allowable concentration of 35 ppm for 1 hour average levels. The 8 hour primary and secondary standards allow an average concentration of no greater than 9 ppm. The Toms River monitoring station reported average levels over 9 ppm for an 8 hour period four times in 1980. The 1 hour standard of 35 ppm recorded was not violated by this station.

Smoke Shade

Smoke shade is the relative amount of particulates detected. This value varies by size and color. There are no standards for smoke shade established at this time. The levels of smoke shade detected at Toms River in 1980 averaged 4 ppm.

The Lakewood Municipal Landfill is approximately 9 miles northwest of downtown Toms River. The Jackson Township particulate monitoring station is approximately 6 miles north of the landfill. The areas surrounding both of these stations are considerably more developed than the immediate area around the fill. These areas are both of good air quality with regard to attainment of standard levels. From this information, it is obvious that the ambient air quality around the landfill is at least comparable to these two station sites.

Reference 7

OR 48/98

Climate

Ocean County is known to exhibit a continental climate. The monthly average temperatures range from a high of 76°F in July to a low of 31°F in January. Extreme temperatures range from over 95°F to 5°F. The agricultural growing season ranges from 145 to 160 days.

Annual precipitation in Ocean County averages 45 inches. Precipitation is usually well distributed with an average of 3 to 5 inches falling each month. The months of greatest precipitation are generally July and August, while January and February are the driest. Approximately 17 inches of the precipitation falling on Ocean County occurs in the form of sleet or snow.

Prevailing wind directions are westerly or northwesterly in the winter. In the summer, the prevailing winds are from the south. Hurricanes and tornados are both rare in the area with only 19 hurricanes and 4 tornados reported in the last 50 years.

Reference 7 4/98

2.1.6 Ecological Features

The Lakewood site has been extensively disturbed by landfilling and sand mining operations. Much of the area proposed for the Phase I expansion lies within the denuded inactive sand pit adjacent to the landfill. South of these disturbed areas, lies a block of vegetated, undeveloped land which extends to Whitesville Road. This area, lying within the Dover and Jackson Township portions of the proposed site, is vegetated with an upland oak/pine forest community. This area is reasonably continguous, except for several dirt road cuts. Evidence of trash dumping and tree removal was also commonly encountered.

The oak/pine forest contains a mixture of assorted oak species with pitch pine and short-leaf pine. Oak species commonly encountered in this area include northern red, white, black, scarlet and chestnut oaks. The shrub layer associated with this association includes black huckleberry, lowbush blueberry and dangleberry.

Wildlife species which would be expected at this site include typical upland forest species including bluejays, crows, bobwhite quail, red and grey squirrels, eastern chipmunks, grey fox, raccoon, short-tailed shrew, eastern cottontails, and white-tailed deer. Forest areas bordering Whitesville Road, the disturbed areas, and adjacent agricultural lots provide an "edge" effect, which could be expected to increase species density and diversity.

Aquatic biota in the immediate vicinity of this site is insignficiant as no surface streams directly border or bisect this site.

Reference 7
OB 50/98

2.2 Man-Made Resources

2.2.1 Population Density Distribution

After decades of rapid growth, the population increase of New Jersey slowed considerably between the years 1970 and 1980. New Jersey, in the last ten years, has experienced a change of population structure, with the urban areas losing population while the suburban and rural areas gained. Between 1970 and 1980, the overall growth rate of New Jersey was only .03%, which represents an increase of 196,158 people from a 1970 population of 7,168,000 to 7,364,158 in 1980. This is in contrast to a 18.1% population increase between 1960 and 1970. During that span, the State gained over 1 million new residents. Nationwide the State still ranks eighth in population, as it did in 1970, and is forty-fifth in land area making it the most densely populated of the fifty states.

Ocean County is, and for the last three decades has been, the most rapidly growing county in New Jersey. In the years between 1950 and 1960 county population increased 91% from 56,622 to 108,241 residents. By 1970, Ocean County's population had again almost doubled, increasing by 92.5% to a total of 208,470 persons. The growth trend continued between the years 1970 and 1980 only slowing slightly to a rate of 66%. This represented an increase of 137,568 County residents for a 1980 Ocean County population of 346,038. Sussex County, in the northwest part of the State, was the second fastest growing county between 1970 and 1980 with a growth rate of 49.8%. Between the years 1960 to 1970, Burlington County, which borders Ocean County to the west, was the second fastest growing county with a growth rate of 43.9%.

Statewide, population density averaged 957 persons per square mile in 1970 as compared to 983 persons per square mile according to 1980

Reference 7
DR 51/98

preliminary census reports. In Ocean County, with a land area of 637.09 square miles, the density average was 327 persons per square mile in 1970 and is approximately 543 persons per square mile in the 1980 census reports.

The area of study for the Northern Landfill Site includes portions in the municipalities of Dover Township, Lakewood and Jackson Township.

Dover Township is the most populated municipality in Ocean County with a population of 64,455 reported by the 1980 census. This equates to a population density of about 1549 persons per square mile. In 1970, the population of Dover was 43,751 people with an average of 1051 persons per square mile in a 41.62 square mile area. Dover Township's growth rate for the ten year period between 1970 and 1980 is 47%, with an influx of 20,704 people into the community.

Lakewood reported a 1970 population of 25,223 people within its 20.40 square mile border, for a density of 1034 persons per square mile. The 1980 census count recorded Lakewood's population at 38,464 which yields a density of 1,576 persons per square mile. This ten year growth of Lakewood represents an increase of 13,241 people or a 52% increase.

Jackson Township had a 1970 population of 18,276 people which equals a density of 182 persons per square mile. In 1980, the census recorded Jackson's population at 25,644 people within a 100.30 square mile area, for a density of 255 persons per square mile. This 1980 population represents an increase of 7,368 people for a 40% growth rate.

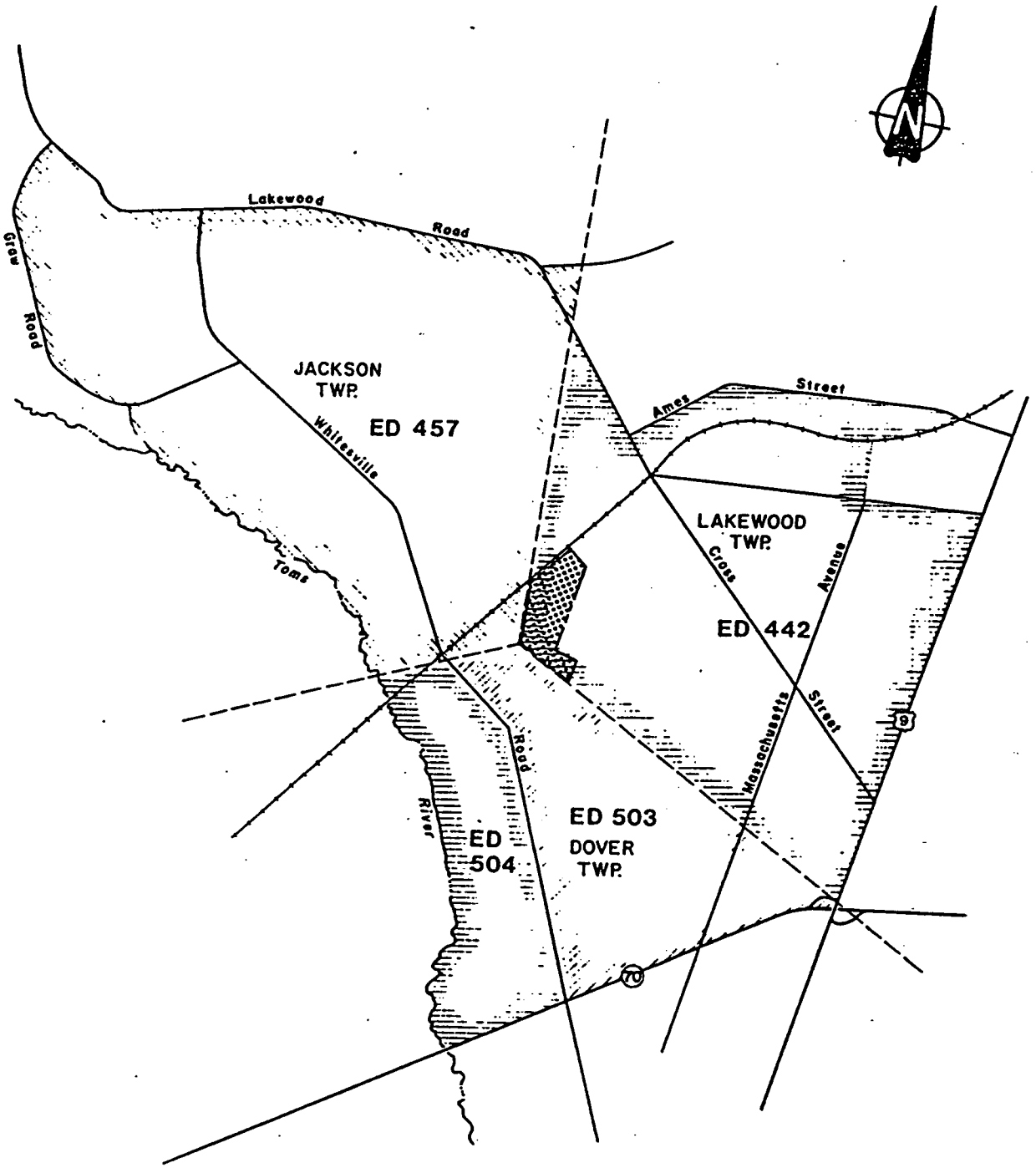
According to the 1970 census records, these three municipalities accounted for 42% of Ocean County's population within 26% of the land

area. The 1980 count indicates that these three accounted for 37% of the total county population. Lakewood and Dover Township have population densities of more than twice the county average while Jackson Township has a density distribution of roughly half the county average of 543 persons per square mile. These three municipalities still make up a sizeable portion of total county population but are growing at rates slightly slower than the County average.

For purposes of our study, the population was further broken down into the area immediately surrounding the existing fill and proposed expansion. This population breakdown was done by using Enumeration District (ED) numbers and Census figures for population within these districts. See Plate 9. These E.D. districts extend up to 3 miles from the fill in some directions. The total population of the four E.D zones around the Northern landfill site is 2,641 persons. To further breakdown this population, census figures indicate that ED 442 has a total population of 1,475 with a density of approximately 467 persons per square mile. ED 457 in Jackson Township has a population of 837 (230 persons per square mile). ED 503 in Dover Township has 28 residents and a population density of 26 persons per square mile. The final ED considered, ED 504 in Dover Township has 301 people within its boundries, or 397 persons per square mile. All of these densities represent totals that are significantly lower than the municipal averages, listed earlier, of this area. Furthermore, these densities are lower than the Ocean County overall average of 543 people per square mile.

Any consideration of Ocean County's population would not be complete if mention were not made of large amounts of seasonal residents.

Reference 7 53/88



OCEAN COUNTY BOARD OF FREEHOLDERS

OCEAN COUNTY, NEW JERSEY

ENUMERATION DISTRICTS
LAKEWOOD MUNICIPAL LANDFILL

SEPTEMBER, 1981

SCALE: 1"=4000'

Elson T. Killam Associates, Inc.

Environmental and Hydraulic Engineers

27 Bleeker Street Millburn New Jersey

RUNNING 44-142 32466

Reference 7 54/98

Many ocean front communities have a summer population of 10 times their year around population. Ocean County as a whole has been estimated to be inhabited by 650,000 or more people on many summer weekends. The areas of our immediate study however, are not shore resort areas and therefore do not attract a large seasonal population. Lakewood was once a thriving resort town and indeed a few resorts and health spa operations still exist within the Township. The Great Adventure Amusement Park brings a large daily tourist trade, in season, to Jackson Township. In Dover Township, there were over 6,000 seasonal homes reported in the 1970 Census. In these past ten years, many of these seasonal residences have been converted to year around dwellings. However, it is estimated that Dover may contain some 1700 summer residences. In fact within the one mile study area around the landfill, there were no resorts, health spas or summer communities.

Another aspect of Ocean County population is the large amount of retirement communities established therein. Since these communities are year around in nature, their population is included in our previous discussion of County population levels. As of the 1978 Ocean County 208 Water Management Study, there were 26 retirement villages county wide. Fourteen of these were spread over the communities of Dover, Jackson and Lakewood. The closest community to the Northern Landfill site is Roberts Mobile Home Park which is in Dover Township and over 1 1/2 miles from the site.

Reference 7 55/98

2.2.2 Land Use

The existing land use around the Lakewood Municipal Landfill consists of residential, agricultural, industrial-commercial, quasi-public, utilities and extractive mining parcels. The majority of the land in the immediate vicinity of the landfill is presently open spaces with wooded lots. The NJ Turnpike Authority owns some of this property. The property was acquired for the proposed Driscoll Expressway. Other undeveloped properties in the area are owned by Lakewood, Dover, and Jackson Townships.

A significant area in the vicinity of the landfill is used for agricultural purposes. Plate 7 shows the current land use for the area approximately one mile from the existing landfill and proposed expansion areas. Within this one mile radius, there are an estimated 45 lots used for residential purposes, 5 large parcels of land are devoted to agricultural purposes, while approximately 5 more lots are used commercially. The largest single parcel of land devoted to one land use in the area is the existing Lakewood Municipal Landfill.

Dover Township and Lakewood Township are two Ocean County communities that are reasonably well developed. In fact these two municipalities are significantly more developed than other county municipalities to the south and to the west. In spite of this, the Lakewood landfill is located in a relatively remote area. It is approximately two miles eastward from the center of the present fill to the more highly developed areas along Route 9. A new housing development is currently under construction approximately 1 1/2 miles from the center of the present fill on the corner of Massachusetts Avenue and Cross Street. The remainder of the area surrounding the fill is not significantly developed.

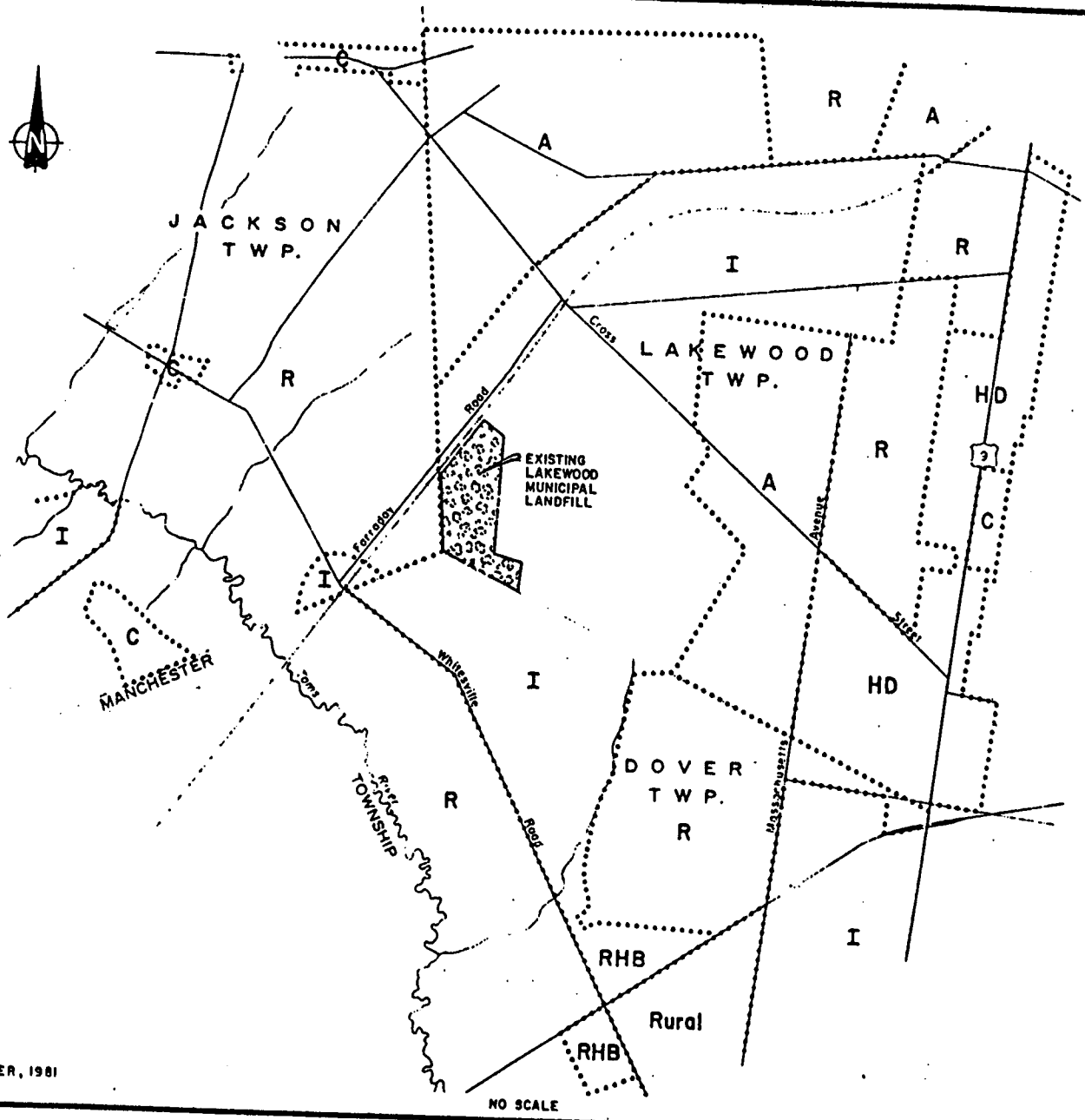
Reference 7
OR 56/98

2.2.3 Zoning

Present zoning regulations imposed by the three municipalities around the Lakewood Municipal Landfill include areas of residential, agricultural, commercial, industrial, highway development and rural highway business uses. Plate 8 shows the approximate boundaries of the designated zones around the Lakewood landfill. As seen from this Plate, the areas directly around the existing landfill in both Lakewood and Dover Township have been zoned for industrial purposes. Allowable uses in this area may include but are not limited to such uses as manufacturing and industrial park complexes. At the present time, a few homes and approximately three small industrial facilities are present.

Jackson Township has zoned the property within their Township, that is close to the present landfill, for residential uses with a small section zoned industrial. Two small facilities presently are within the industrial zone, while the residential zone is largely undeveloped. To the east of the industrial tract in Lakewood Township, a fairly large area is zoned for agriculture. Present use of this area includes a horse farm and this area is also largely undeveloped. The area zoned residential in Lakewood on the corner of Massachusetts Avenue and Cross Street is just beyond the one mile study area around the site. This residential area is presently being developed as a small lot housing development. Further to the east in the area around Route 9 Lakewood has a zone for highway development and commercial. This area is more than one mile from the site and present uses include shopping and service stations.

The remaining areas shown on the Plate 8 in Dover Township are zoned for residential uses. At this time, the area south of Whitesville



LEGEND

- R – RESIDENTIAL
- A – AGRICULTURAL
- C – COMMERCIAL
- I – INDUSTRIAL
- HD – HIGHWAY DEVELOPMENT
- RHB – RURAL HIGHWAY BUSINESS

REFERENCE:
LOCAL TOWNSHIP ZONING MAPS - SIMILAR ZONES WERE COMBINED BY ETKA

SEPTEMBER, 1981

NO SCALE

OCEAN COUNTY BOARD OF FREEHOLDERS
OCEAN COUNTY, NEW JERSEY
EXISTING ZONING
LAKEWOOD MUNICIPAL LANDFILL

Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers

PLATE 10

Reference 7 5798

Reference 7 58/78

Road is developed with approximately twenty homes. The remaining areas shown in Dover Township allow more residential development, rural highway business and a rural area. These areas are beyond our mile study area and are largely undeveloped at this time. As noted earlier, the residentially zoned area around the Lakewood landfill in Jackson Township is largely undeveloped near the site. The commercial and industrial zones shown in Jackson Township are past the limits of the mile study area and are moderate to sparsely developed.

Reference 7 59/98

2.2.4 Sensitive Receptors

The communities of Lakewood, Jackson and Dover Townships include many schoools, churches, major housing developments and a large community hospital. All of these would be classified as sensitive receptors, but they are located further than one mile from the landfill site.

From a historical perspective, these communities also have a rich heritage. Again, the study area around the Lakewood Municipal Landfill, is well isolated from any historic sites. The nearest historical site as reported in the 1978 Ocean County 208 Study is located at Georgian Court College in Lakewood. This site is located almost two miles from the existing landfill and is not listed on the National Register of Historic Places. The nearest national historical site is Hanger 1 at the Lakehurst Air Engineering Center. The Hanger is far to the southwest of the study area in Manchester Township. The mile study area around the landfill is fairly rural when compared to the majority of the land in these two communities. Investigations of the area revealed no churches, no archaeological sites, no schools or other sensitive receptors in our study area and with the exception of the homes mentioned, several small business sites and a horse farm operation. The study area is otherwise undeveloped.

A special category of sensitive receptors in the context of a landfill study consist of large capacity public water suppy wells. Three such wells are located in the study area. The closest well is owned by the Toms River Water Company and is located approximately one mile southeast of the existing landfill. This well is 142 feet deep and is pumped at the rate of approximately 1 million gallons per day. Northeast

Reference 7 10/98

of the landfill, also at a distance of approximately one mile are two wells owned by the New Jersey Water Company. These wells have combined diversion rights of 1.1 MGD and are currently pumped at approximately .85 MGD. These wells are over 700 feet deep and draw from the Englishtown formation. The Toms River Water Company well is the most sensitive of the three as it is pumped at the highest rate, and lies in the general direction of groundwater movement and aquifer tilt.

Reference 7 6178

2.2.5 Aesthetics

The areas of the site which have been used for landfilling or for mining have very little aesthetic value, as they are mostly denuded and have highly irregular contours. Between these disturbed aress and Whitesville Road, is a large area of forested land. This portion of the site has value chiefly from the extensive wooded, rural character it imparts to the area along Whitesville Road. This wooded area also effectively buffers the homes along Whitesville Road from the landfill operation.

Reference 7 62/78

landfill percolates through the garbage causing the formation of leachate. This leachate migrates downward, enters and mixes with goundwater and migrates away from the site, following existing groundwater flow patterns.

Pollutants in leachate are normally attenuated by on-site soils in varying degrees. The degree of attenuation depends on the pollutants involved and the nature of the soil. The sands found at the Lakewood site possess poor attentuative capability and encourage the relatively rapid movement of groundwater. Nonetheless, contaminants in groundwater move at a rate much slower than the groundwater itself. In many cases, leachate entering the groundwater takes years to migrate off-site and enter nearby wells in significant concentrations. At this time, the concentration of contaminants found at off-site wells is far lower than near-field wells, such as PN-2. Additional monitoring wells would be necessary to determine if higher concentrations of contaminants are still traveling off-site or if the present condition is in a stable, steady-state equilibrium. In any event, the most practical approach to this problem is to stop the flow of leachate into the groundwater. This can be accomplished by covering the fill with an impermeable barrier to cut off the downward percolation of rainwater which forms leachate. Since the data developed to date indicates that garbage has been placed above the water table, capping the fill should greatly reduce leachate production from the fill. With this accomplished, groundwaters would eventually flush existing contaminants from the site, which would result in a long-term improvement in water quality.

The areas proposed for Phase 1 and Phase 2 expansion will be

Reference 7
OB 63/98

lined with two impermeable barriers, as indicated in Section 1.0. Leachate collected by the liners will be pretreated and removed from the site. Therefore, the new fill activities will have a minimal impact on groundwater quality.

As a part of the process of implementing the project, certain hydrogeological analyses must be conducted to provide a sound basis for the final design of the landfill and for the implementation of permanent groundwater monitoring systems. These analyses will also serve to further define the degree and extent of existing contamination at the site. It is recommended that this work be completed prior to the actual acquisition of the site by the County in order to clearly establish pre-existing conditions. This will help define the County's position regarding liability. We recommend that the additional studies which are undertaken be designed to accomplish the following objectives:

1. Verify existing water quality data through the use of an additional sampling round conducted by an independent laboratory.

2. Expand the list of parameters tested to include all priority pollutants.

3. Map, using highly specialized and sophisticated testing procedures, the extent and degree of the existing contamination at the site.

4. Grid the existing filled area with additional borings to verify that garbage does not lie below water table at any location at the site.

5. Determine the rate of pollutant migration and rate of groundwater migration.

To summarize, the county's concept of acquiring existing landfill sites has several benefits but also carries the implicit risk of

Reference 7 DB 64/98

assuming a certain degree of liability. The Lakewood landfill is typical of an unlined landfill and, as such, was found to cause an effect upon local groundwater. Based on data developed to date, this situation can be managed by capping the fill.

With respect to surface waters, runoff from the site will be routed to recharge basins, thereby controlling siltation in any drainage channels and promoting groundwater recharge. Runoff will not contact solid waste and will therefore, not become chemically contaminated.

3.1.4 Air Quality/Climate

The proposed project will not cause a significant increase in air emissions on a county-wide basis. Components of the project which affect air quality are emissions from landfill equipment and, primarily, garbage trucks travelling to the landfill. This occurs as an existing condition. With the implementation of expanded landfilling operations at Lakewood, a significant increase in the number of vehicle miles travelled is not expected. However, the pattern of truck routes will be changed, with an increase in truck trips and miles travelled on local roads, particularly Whitesville Road, Route 9 and Route 70. However, considering the generally good air quality found in this area, this represents a minor impact. Also dust control measures will be instituted at the regional site and access roads will be paved to further reduce air quality impacts.

Odors resulting from the proposed project represent a potential impact. Since the site is presently used for landfill operations, the potential for odors occurs as an existing condition. By continuing landfilling operations at this site, the potential for odor problems will continue at this site. However, this potential can be minimized by following a rigorous operating program at the landfill.

Reference 7
DR 65/18

Another aspect of a landfill which affects air quality is the production of gas by buried wastes. Uncontrolled, these gases can migrate through the ground and can affect vegetation and nearby dwellings (if any are present). If allowed to accumulate in a confined area, the potential for ignition and explosions can occur. This impact will be avoided through the use of a gas venting system which will harmlessly disperse landfill gases to the atmosphere.

The gases which are vented in this manner will primarily consist of methane and carbon dioxide. While methane is a hydrocarbon, total county-wide emissions from this source will be the same under any landfill alternative, including the present situation.

3.1.5 Noise

Noise emissions from the site will result from truck traffic entering the fill and from the operation of landfill equipment. The highest off-site noise levels will be associated with trucks along the primary access routes. Noise levels of 88 dbA are expected within 50 feet of the roadways. Noise from the site itself will be reduced well below this level by the forested buffer. In addition, noise will be restricted by limiting the operation of the facility to business hours.

3.1.6 Ecological Features

The proposed project is not expected to have any significant impacts on aquatic biota. With respect to terrestrial biota, expansion and development of the site will result in the displacement of approximately 70 acres of oak/pine forest and associated wildlife. While this is not a unique type of habitat in this area, it does have ecological value and the project will result in an incremental loss. Most of this habitat

displacement, however, occurs in the Phase 2 expansion. Should a resource recovery alternative be implemented in Ocean County, the life of Phase 1 will be extended. Phase 2 impacts can thereby be postponed, perhaps indefinitely.

At present, the landfill operation attracts large numbers of gulls which feed on the active face of the landfill. This situation will probably continue in the future. No successful method has yet been devised to keep gulls away from landfill operations.

3.2 Man-Made Resources

3.2.1 Zoning and Land Use

As discussed previously, land uses surrounding the landfill are mixed in nature and include a number of residential parcels. It is well known that landfills and residential uses of land are incompatible and should be separated to the extent possible. Periodic odors, birds, garbage truck traffic, and concerns over groundwater contamination form the basis of this incompatibility. Given that northern Ocean County is relatively well developed, and given the need for a solid waste disposal site with good access to waste generating population centers, the Lakewood site is attractive in terms of its relative remoteness and isolation from nearby population centers. Nonetheless, immediately adjacent neighbors can be expected to be impacted by the presence of the landfill. Visual impacts (in Phase 2), truck traffic, and periodic odors should be anticipated. However, in view of various siting constraints, transportation considerations, and Pinelands regulations, it is unlikely that another site could be found in the northern part of the County which would impact on substantially fewer residents.

Reference 7 67/98

In order to mitigate impacts from the landfill, a substantial buffer (550 feet along Whitesville Road) has been proposed. During Phase 1, buffers will be even greater (approximately 2000 feet along Whitesville Road).

Areas to be included in the landfill expansion are primarily zoned for industrial use. This includes the Lakewood and Dover sections of the site. The small portion of the site (slightly over 20 acres) which is included in Jackson Township is zoned residential. While the landfill is an inconsistent use within a residential zone, the area in Jackson is isolated from adjacent residentially-zoned land across Faraday Road by the existing railroad tracks. Further, this area directly borders the existing landfill and industrially zoned land in Dover and therefore, has no direct access. The Jackson parcel's suitability for residential purposes is doubtful.

3.2.2. Population Density and Distribution

While Dover and Lakewood are among the most densely populated municipalities in Ocean County, the population and land use analysis presented in Section 2.2 of this report clearly shows that the Lakewood site is relatively remote and will not impact significant population centers.

3.2.3 Access and Transportation

The waste load entering the northern regional landfill is estimated between 746 tpd and 1149 tpd. The number of trucks transporting that amount of waste depends on the size and density of the waste in the

Reference 7 68/98

trucks. Large, 25 cubic yard refuse trucks usually compact to about 500 or 600 pounds per cubic yard. Frequently, however, many trucks are not completely full when they enter the site. A good method to use to estimate the number of trucks entering the site would be to examine the truck data at a landfill which has relatively accurate records. Southern Ocean Landfill, Inc., (SOLF) in Ocean Township has good truck count data for the entire year 1979. By comparing truck numbers with known volumes of waste for a one year period at Southern Ocean Landfill, a reasonable estimate of the numbers of trucks which can be expected to enter the northern site can be made.

The operational records at SOLF indicate that on an annual average, 13 cubic yards of refuse enter in a truck. At approximately 500 pounds per cubic yard, the 13 cy represents approximately 6.5 tons of refuse per truck. Therefore, approximately 115 to 170 trucks per day will enter the northern site. Of course, that is equivalent to 230 to 340 truck trips passing a structure on the primary route to the landfill.

There is no impact of this truck traffic on the condition or service life of the roads surrounding the northern site. There will be an aesthetic and nuisance impact on the surrounding land-uses from this volume of truck traffic. A certain amount of noise, dust, and litter will accompany the extra traffic.

3.2.4 Sensitive Receptors

Our analysis of land uses surrounding the Lakewood landfill indicates that there are no sensitive land uses (schools, hospitals, etc.) located within a one mile readius of the landfill. The Toms River Water

Reference 7 69/98

Company well (a water quality receptor) will not be impacted by the expanded landfill, as the new lined facility will not result in the addition of leachate to the groundwater.

3.2.5 Aesthetics

Expanding the Lakewood site may cause local aesthetic impacts. This will result from the removal of existing areas of oak/pine forest in the Phase 2 expansion area. In addition, the proposed fill will be finished at an elevation of 180 feet. As a result, the fill will be more visible from adjacent roadways as compared to the existing operation which has a maximum elevation of 130 feet. This additional 50 foot elevation will not be fully visible, however, since the vegetation in the buffer areas will not be removed, the remaining trees will shield much of the landfill from view.

Reference 7.0/98

7.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

In order to implement the project, it will be necessary to irreversibly commit certain resources. It should be emphasized that the project has been designed to minimize this initial commitment by utilizing a modular/small cell approach. In this way, the project does not demand the use of this technology over a long period to financially justify the "front-end" expenditure. Resources can be directed to another option, such as resource recovery, at an appropriate time.

The primary commitment that is necessary at this time is the investment of funds and materials necessary to begin Phase 1 operation. Also, by using land for solid waste disposal, the land is limited with regard to its future use.

The cost for construction of the Phase 1 landfill will be staged over the life of the Phase. The landfill cells are about 5 acres in size. They will be constructed two at a time. The two cells will last the County about two years at current landfilling rates. Therefore, about $1 million every two years will be expended to construct subsequent landfill cells. Of course, these costs do not include the other fixed costs at the landfill such as equipment.

Reference 7 7/1/98

9.0 CONCLUSIONS AND RECOMMENDATIONS

The implementation of a regional landfill at any location in Ocean County will result in adverse environmental impacts on the local environment. However, the implementation of the county solid waste plan, which includes two upgraded landfills, will have a significantly beneficial impact compared with the presently poorly-run solid waste disposal procedures.

The production of large quantities of solid waste in Ocean County is a reality. The disposal of that solid waste in numerous unlined landfills within the County presents a significant threat to the quality of the local environment. The use of the Lakewood site as an upgraded regional landfill facility represents an effective and reasonable alternative in the county's effort to deal with this problem. While certain adverse impacts will occur at this site, this location is a viable and advantageous one for the intended use. Since the site is presently used for landfilling, the effect of a solid waste disposal facility at this location on surrounding land uses is lessened. The proposed project represents the continuation of a pre-existing use rather than the imposition of a landfill as a new land use. The use of an existing landfill also effectively provides for the closing of an existing out-moded operation. The County's willingness to close the facility using "state-of-the-art" techniques which exceed existing State requirements, provides a benefit to the local groundwater environment when compared to the more traditional and less effective closing which would likely occur without the County's presence.

The greatest single drawback to the use of an existing landfill is the risk associated existing conditions. Conceivably, the County could

Reference 7 7/98

be held responsible in the future for damages caused by past solid waste disposal. Since all existing landfills in the County are unlined, groundwater contamination would be anticipated at each and every facility. Testing groundwater quality at the Lakewood site was done not for the purpose of impact assessment, since the project will affect site and groundwater quality improvements, but to avoid the County's acquisition of an unmanageable environmental risk as evidenced by extensive and severe groundwater contamination; the presence of conditions which might constitute a health hazard; evidence that reasonable measures (capping the site) would not stop the contamination; and/or indications that extraordinary measures would be needed to correct the situation (continuous groundwater pumping or removal of fill).

The data developed at the Lakewood site do not suggest that such a problem exists. However, in view of the possibility of future risk, we recommend that the County proceed with the hydrogeological studies discussed in Section III prior to actually taking legal title to the site. This work is recommended as the first step in a process which leads to the acquisition of the site and implementation of the project. It is noted also that these studies will be required prior to implementation of the project since they form a necessary basis for certain components of the design. The investment of the necessary funds for such studies at this point (after having passed the initial feasibility screening) is justified prior to the commitment of substantial County dollars in the site. This work will further verify the findings of this study and will more fully define the existing conditions for the purpose of establishing the County's position with respect to the risk and legal liability associated with acquisition of the property.

Reference 7 73/78

From an engineering standpoint, the northern regional landfill site is suitable to allow the construction of an upgraded sanitary landfill. The site has sufficient adjacent property to allow design of a modular landfill with adequate life to meet the County's needs during the planning period. On site geology, hydrology and topography are well suited to a landfill operation. Buffer areas are sufficient to shield the site from adjacent land uses for many years. The use of adjacent property which has been mined in a sand and gravel operation, is an advantage to use of the property in that soil removal to initial landfill grade is minimized.

The economic cost of constructing the northern regional landfill is acceptable. The total annual expenses yield a rate averaged tipping fee which is not excessively high nor which should place a harsh economic burden on any one municipality. The costs are, obviously, higher than the costs of disposal today. However, the secure state-of-the art landfill is designed to protect the groundwater of Ocean County and to serve all of the disposal needs of the northern solid waste shed for many years.

Currently, an existing privately owned and operated landfill, Ocean County Landfill Corp., in Manchester Township, accepts waste from some northern Ocean County municipalities. If OCLF remains open, they will have to construct improvements which will raise their tipping fee. If their tipping fee is lower than the tipping fee at the northern regional site, there is the possibility that refuse assumed to be dedictated to the northern landfill might go to OCLF. Such a condition, unless controlled by the County, could adversely affect the economics of the two regional landfills. We recommend that an intensive effort be made

Reference 7 74/98

to insure that either they upgrade to the County's level of engineering in the northern regional landfill and hence have a comparable tipping fee, or that the County, perhaps in concert with Manchester Township, petition the State to close OCLF.

To summarize, we have found that the Lakewood site represents a feasible location for a regional landfill site. It is environmentally acceptable, and feasible from an engineering and economic standpoint. There is a degree of risk inherent in acquiring this site, hence further definition of groundwater conditions is appropriate and recommended. We suggest the following steps be taken to implement the proposed project:

1. There should be a clear, firm commitment by the County government to develop the project at this site unless circumstances disadvantageous to the County develop. Such circumstances might include lack of State concurrence, inability of the County to implement the overall County plan, or discovery of unmanageable groundwater conditions.
2. Seek the concurrence of the regulatory agencies on a detailed implementation schedule which targets completion dates for the following steps:
   a. Geo-hydrological testing (as discussed in Section 3).
   b. Site Acquisition.
   c. Final Design.
   d. Permit Acquisition.
   e. Construction.
   f. Operation.

Reference 7 75/98

If there is agreement between the County and the DEP and final design is begun by early 1982, it is conceivable that landfill operation could begin by the summer of 1983.

Reference 7 76/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO.EN-1

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms	<10		
Fecal Coliforms	<10		
PH	6.5	6.3	5.9
Hardness	14	18	13
Sulfate	6.0	3.7	9.4
TDS	39	65	45
Nitrite & Nitrate	.42	.36	1.3
MBAS	.04	<.01	<.01
Phenols	.001	.002	.002
BOD		6.0	560.0
COD	5.6	3.2	10.0
Chloride	15	8	4.0
Odor	200	16	20.0
Fluoride	<.05	.10	<.05
Cyanide	<.02	<.02	<.02
Chromium	<.06	<.06	<.06
Mercury	<.001 (7/28/81)		
Lead	<.1	<.1	<.1
Iron	3.6	2.0	30.6
Manganese	.39	.02	.20
Zinc	.22	.01	.09
Copper	.05	<.03	.03
Cadmium	<.01	<.01	<.01
Barium	<.1	<.1	.16
Silver	<.03	<.03	<.03
		7.02	2.94
Arsenic	<.005	<.005	<.005
Selenium	<.005	<.005	<.005
Benzene	<.001	<.001	<.001
Toluene	<.001	<.001	<.001
Ethylbenzene	<.001	<.001	<.001
Xylene	<.001	.006	<.001

Note: All results expressed as parts per million.

< means less than, typical all sheets

Reference 7/7/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-1

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms			
Fecal Colfiorms			
PH	6.0	5.8	5.5
Hardness	18	10	10
Sulfate	12	8	8.3
TDS	49	35	41
Nitrite & Nitrate	.07	.10	.09
MBAS	.02	.03	.01
Phenols	.001	.003	.002
BOD		<.1	40.0
COD	.8	8.4	10.0
Chloride		8	9
Odor		2	1
Fluoride	<.05	<.05	<.05
Cyanide	<.02	<.02	<.02
Chromium	<.06	<.06	<.06
Mercury			
Lead	<.1	<.1	<.1
Iron	20.9	8.1	3.28
Manganese	.03	<.02	.02
Zinc	.03	.03	.02
Copper	<.03	<.03	<.03
Cadmium	<.01	<.01	.01
Barium	<.1	<.1	.12
Silver	<.03	<.03	<.03
Sodium	5.3	5.7	4.88
Arsenic	<.005	<.005	<.005
Selenium	<.005	<.005	<.005
Benzene	<.001	<.001	<.001
Toluene	<.001	<.001	<.001
Ethylbenzene	<.001	<.001	<.001
Xylene	<.001	<.001	<.001

Note: All results expressed as parts per million.

Reference 7
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NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-2

Parameter	5/28/81	6/19/81	7/1/81
Total Coliforms	<10		
Fecal Coliforms	<10		
PH	7.2	6.8	7.2
Hardness	20	220	240
Sulfate	7	<.1	1.7
TDS	360	533	528
Nitrite & Nitrate	.1	.06	.08
MBAS	.01	.06	.05
Phenols	.017	.042	.027
BOD		48.0	590.0
COD	22.4	21.6	144.0
Chloride	105	80	71
Odor	32	100	200
Fluoride	<.05	<.05	.1
Cyanide	<.02	<.02	<.02
Chromium	.26	.07	.09
Mercury		.001(7/28/81)	
Lead	<.1	.1	<.1
Iron	364.0	165.8	160.1
Manganese	.26	.12	.12
Zinc	.11	.11	.04
Copper	.19	.08	.09
Cadmium	<.01	<.01	.01
Barium	<.1	<.1	<.1
Silver	<.03	<.03	<.03
Sodium	39.23	55.4	55.7
Arsenic	<.005	<.005	<.005
Selenium	<.005	<.005	<.005
Benzene	.002	.008	.009
Toluene	.005	.009	.009
Ethylbenzene	.075	.194	.204
Xylene	.090	.206	.229

Note: All results expressed as parts per million.

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NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-3

Parameter	5/27/81
Total Coliforms	
Fecal Coliforms	
PH	7.4
Hardness	83
Sulfate	12.5
TDS	369
Nitrite & Nitrate	.61
MBAS	.03
Phenols	.03
BOD	
COD	28.8
Chloride	110
Odor	
Fluoride	
Cyanide	
Chromium	
Mercury	
Lead	
Iron	
Manganese	
Zinc	
Copper	
Cadmium	
Barium	
Silver	
Sodium	
Arsenic	
Selenium	
Benzene	<.001
Toluene	<.001
Ethylbenzene	<.001
Xylene	.001

Note: All results expressed as parts per million.

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80/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-4

Parameter	5/27/81	7/1/81
Total Coliforms		
Fecal Coliforms		
PH	6.4	5.6
Hardness		10
Sulfate		6.8
TDS	37	27
Nitrite & Nitrate	.23	.27
MBAS	.02	.01
Phenols	.002	.002
BOD		<.1
COD		1.6
Chloride	45	4
Odor		2
Fluoride	<.05	<.05
Cyanide	<.02	<.02
Chromium	<.06	<.06
Mercury		
Lead	<.1	<.1
Iron	9.2	6.27
Manganese	<.02	<.02
Zinc	.02	.03
Copper	<.03	<.03
Cadmium	<.01	<.01
Barium	<.1	.22
Silver	<.03	<.03
Sodium	2.6	1.79
Arsenic	<.005	<.005
Selenium	<.005	<.005
Benzene	<.001	<.001
Toluene	<.001	<.001
Ethylbenzene	<.001	<.001
Xylene	<.001	<.001

Note: All results expressed as parts per million.

Reference 7

81/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-5

Parameter	5/27/81	6/19/81
Total Coliforms		
Fecal Coliforms		
PH	5.6	5.6
Hardness	18	10
Sulfate	14	10
TDS	56	54
Nitrite & Nitrate	.29	.17
MBAS	<.01	.02
Phenols		.031
BOD		4.0
COD	2.0	11.2
Chloride	40	5
Odor		
Fluoride	<.05	
Cyanide	<.02	
Chromium	.16	<.06
Mercury	.001 (7/28/81)	
Lead	<.1	<.1
Iron	198.2	13.92
Manganese	.06	.02
Zinc	.07	.08
Copper	.06	.05
Cadmium	<.01	<.01
Barium	<.1	<.1
Silver	<.03	<.03
Sodium	3.9	5.85
Arsenic	<.005	
Selenium	<.005	
Benzene	<.001	<.001
Toluene	<.001	<.001
Ethylbenzene	<.001	<.001
Xylene	<.001	<.001

Note: All results expressed as parts per million.

Reference 7
82/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-6

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms			
Fecal Coliforms			
PH	6.6	5.6	5.7
Hardness		10	10
Sulfate		8.2	5.6
TDS	67	61	51
Nitrite & Nitrate	.29	.34	.43
MBAS	.01	.05	.01
Phenols	<.001	.002	.004
BOD		8.0	210.0
COD	<.1	1.6	<.1
Chloride	6	5	4
Odor		1	2
Fluoride	<.05	<.05	<.05
Cyanide	<.02	<.02	<.02
Chromium	<.06	<.06	<.06
Mercury			
Lead	<.1	<.1	<.1
Iron	48.6	21.9	4.34
Manganese	.06	.04	.02
Zinc	.04	.02	.07
Copper	<.03	<.03	<.03
Cadmium	<.01	<.01	<.01
Barium	<.1	<.1	<.1
Silver	<.03	<.03	<.03
Sodium	3.5	4.1	3.02
Arsenic	<.005	<.005	<.005
Selenium	<.005	<.005	<.005
Benzene	<.001	<.001	<.001
Toluene	<.001	<.001	<.001
Ethylbenzene	<.001	<.001	<.001
Xylene	<.001	<.001	<.001

Note: All results expressed as parts per million.

Reference 7
83/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-7

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms			
Fecal Coliforms			
PH		5.9	5.4
Hardness		4	15
Sulfate		5.6	4.3
TDS		35	53
Nitrite & Nitrate		.12	.20
MBAS		.02	<.01
Phenols		.013	.003
BOD		<.1	47.0
COD	.8	4.8	12.0
Chloride		4	35
Odor		1	4
Fluoride		<.05	<.05
Cyanide		<.02	<.02
Chromium	<.06	<.06	<.06
Mercury			
Lead	1.1	<.1	.19
Iron	10.2	.73	1.77
Manganese	.05	<.02	<.02
Zinc	.05	.04	.29
Copper	.08	<.03	.03
Cadmium	<.01	<.01	.01
Barium	<.1	<.1	<.1
Silver	<.03	<.03	<.03
Sodium	4.3	4.4	2.35
Arsenic		<.005	<.005
Selenium		<.005	<.005
Benzene		<.001	<.001
Toluene		<.001	<.001
Ethylbenzene		<.001	<.001
Xylene		.014	.004

Note: All results expressed as parts per million.

Reference 7

84/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-8

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms	<10		
Fecal Coliforms	<10		
PH	5.5	4.9	5.3
Hardness	10	4	5
Sulfate	8	3.5	1.5
TDS	20	42	25
Nitrite & Nitrate	.15	.23	.28
MBAS	.01	.01	.03
Phenols	.037	.005	.002
BOD		<.1	340.0
COD	2.8	5.2	14.4
Chloride	40	5	5
Odor	4	4	2
Fluoride	<.05	<.05	.1
Cyanide	<.02	<.02	<.02
Chromium	<.06	<.06	<.06
Mercury		.001 (7/28/81)	
Lead	<.1	<.1	<.1
Iron	68.9	3.51	2.10
Manganese	.21	.08	.05
Zinc	.04	.43	.04
Copper	.13	.12	.04
Cadmium	<.01	<.01	<.01
Barium	<.1	<.1	.15
Silver	<.03	<.03	<.03
Sodium	3.42	4.34	2.48
Arsenic	<.005	<.005	<.005
Selenium	<.005	<.005	<.005
Benzene	<.001	<.001	<.001
Toluene	<.001	<.001	<.001
Ethylbenzene	<.001	<.001	<.001
Xylene	<.001	.009	<.001

Note: All results expressed as parts per million.

Reference 7

85/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PN-9

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms			
Fecal Coliforms			
PH		3.8	6.1
Hardness		11	8
Sulfate		8.0	9.4
TDS		66	47
Nitrite & Nitrate		3.7	.29
MBAS		.03	.01
Phenols		<.001	.003
BOD		1.0	350.0
COD		8.0	1.2
Chloride		12	13
Odor		4	1
Fluoride		<.05	.1
Cyanide		<.02	<.02
Chromium	<.06	<.06	<.06
Mercury			
Lead		<.1	<.1
Iron	35	8.15	2.05
Manganese		<.02	<.02
Zinc	.1	.05	.16
Copper		.03	.04
Cadmium	<.01	<.01	.01
Barium	<.1	<.1	<.1
Silver	<.03	<.03	<.03
Sodium	4.99	8.05	7.35
Arsenic		<.005	<.005
Selenium		<.005	<.005
Benzene		<.001	<.001
Toluene		<.001	<.001
Ethylbenzene		<.001	<.001
Xylene		.001	<.001

Note: All results expressed as parts per million.

Reference 7

86/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. LANDFILL HOUSE

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms	<2		
Fecal Coliforms	<2		
PH	5.4	5.2	5.8
Hardness	16	15	18
Sulfate	14.8	14	15
TDS	47	58	51
Nitrite & Nitrate	.8	.5	.55
MBAS	.02	<.01	<.01
Phenols	.006	.001	.005
BOD	<.1	3.0	1.8
COD	4	6.4	4.4
Chloride	5	6	6
Odor		1	4
Fluoride	<.05	.10	.1
Cyanide	<.02	.02	<.02
Chromium	<.06	<.06	<.06
Mercury		<.001 (7/28/81)	
Lead	<.1	<.1	<.1
Iron	.49	.73	3.02
Manganese	.05	.05	.09
Zinc	.06	.03	.08
Copper	<.03	<.03	<.03
Cadmium	<.01	<.01	<.01
Barium	<.1	<.1	.1
Silver	<.03	<.03	<.03
Sodium	5.4	4.8	3.9
Arsenic	<.005	<.005	<.005
Selenium	<.005	<.005	<.005
Benzene	<.001	<.001	<.001
Toluene	<.001	<.001	<.001
Ethylbenzene	<.001	<.001	<.001
Xylene	<.001	<.001	<.001

Note: All results expressed as parts per million.

Reference 7

97/99

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. LEHMAN

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms	<2		
Fecal Coliforms	<2		
PH	5.7	7.2	7.2
Hardness	3	10	1
Sulfate	6	16	21.0
TDS	252	297	285
Nitrite & Nitrate	.01	.03	.05
MBAS	.02	.02	.02
Phenols		.072	.002
BOD		21.6	6.6
COD		68.4	2.4
Chloride	22	27	31
Odor		16	20
Fluoride		.10	
Cyanide		<.02	
Chromium		<.06	<.06
Mercury	.001 (7/28/81)		
Lead		<.1	<.1
Iron		.31	.02
Manganese		<.02	<.02
Zinc		.03	.02
Copper		.09	<.03
Cadmium		<.01	<.01
Barium		<.1	.16
Silver		<.03	<.03
Sodium		95.9	97.84
Arsenic		<.005	
Selenium		<.005	
Benzene	<.001	<.001	<.001
Toluene	<.001	<.001	<.001
Ethylbenzene	<.001	<.001	<.001
Xylene	<.001	.004	<.001

Note: All results expressed as parts per million.

Reference 7
88/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. FRADY

Parameter	5/27/81		7/1/81
Total Coliforms	<2		
Fecal Coliforms	<2		
PH	6.3		5.6
Hardness	12		13
Sulfate	6.3		8.5
TDS	52		60
Nitrite & Nitrate	.09		.14
MBAS	.01		.02
Phenols	.003		.003
BOD	2.7		.3
COD	4.8		8.4
Chloride	11		13
Odor	2		4
Fluoride	<.05		.1
Cyanide	<.02		.02
Chromium	<.06		<.06
Mercury		.002 (7/28/81)	
Lead			<.1
Iron	3.0		.40
Manganese	.07		.05
Zinc	.18		.03
Copper	<.03		.06
Cadmium	<.01		<.01
Barium	.17		<.1
Silver	<.03		<.03
Sodium	12.1		8.89
Arsenic	<.005		<.005
Selenium	<.005		<.005
Benzene	<.001		<.001
Toluene	<.001		<.001
Ethylbenzene	<.001		.002
Xylene	<.001		.002

Note: All results expressed as parts per million.

Reference 7
89/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. BUZBY

Parameter	5/27/81	6/19/81
Total Coliforms	<2	
Fecal Coliforms	<2	
PH	5.7	6.1
Hardness	8	12
Sulfate	7.4	
TDS	27	37
Nitrite & Nitrate	.05	.07
MBAS	.01	.02
Phenols	.002	
BOD	<.1	
COD	3.2	
Chloride	5	5
Odor		
Fluoride	<.02	
Cyanide	.15	
Chromium	<.06	
Mercury	<.001 (7/28/81)	
Lead	<.1	
Iron	.18	
Manganese	<.02	
Zinc	.04	
Copper	.15	
Cadmium	<.01	
Barium	.11	
Silver	<.03	
Sodium	5.0	
Arsenic	<.005	
Selenium	<.005	
Benzene	<.001	
Toluene	<.001	
Ethylbenzene	<.001	
Xylene	<.001	

Note: All results expressed as parts per million.

Reference 7
90/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. SOUTH JERSEY ALUMINUM

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms	<2		
Fecal Coliforms	<2		
PH	5.8	6.2	5.8
Hardness		4	5
Sulfate	<.01		4.6
TDS	21	28	19
Nitrite & Nitrate	.08	.04	.04
MBAS	.01	.01	.02
Phenols	.004		
BOD			
COD			
Chloride	4	4	4
Odor	<1		
Fluoride	.02		
Cyanide	.15		
Chromium	<.06		
Mercury		<.001 (7/28/81)	
Lead	<.1		
Iron	.98		
Manganese	.03		
Zinc	.35		
Copper	.08		
Cadmium	<.01		
Barium	.16		
Silver	<.03		
Sodium	5.3		
Arsenic	<.005		
Selenium	<.005		
Benzene	<.001		
Toluene	<.001		
Ethylbenzene	<.001		
Xylene	<.001		

Note: All results expressed as parts per million.

Reference 7

9/1/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. WERBLER

Parameter	5/27/81	7/1/81
Total Coliforms		
Fecal Coliforms		
PH	5.5	5.5
Hardness	52	49
Sulfate		2.6
TDS	164	162
Nitrite & Nitrate	7.0	12.2
MBAS	.01	.01
Phenols		.006
BOD		1.2
COD		2.4
Chloride	8	10
Odor		1
Fluoride		.1
Cyanide		<.02
Chromium		<.06
Mercury	<.001 (7/28/81)	
Lead		<.1
Iron		.17
Manganese		.11
Zinc		.04
Copper		.38
Cadmium		<.01
Barium		.15
Silver		.11
Sodium		3.98
Arsenic		<.005
Selenium		<.005
Benzene	<.001	<.001
Toluene	<.001	<.001
Ethylbenzene	<.001	<.001
Xylene	<.001	<.001

Note: All results expressed as parts per million.

Reference 7
92/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. LOMBARDI

Parameter	5/27/81	6/19/81	7/1/81
Total Coliforms	<2		
Fecal Coliforms	<2		
PH	6.0	5.7	5.8
Hardness	13	18	14
Sulfate	12		1.0
TDS	43	58	48
Nitrite & Nitrate	2.5	2.4	2.3
MBAS	.02	.02	.01
Phenols	.003		
BOD	<.1		
COD	<.1		
Chloride	5	6	6
Odor	<1		
Fluoride	<.02		
Cyanide	.15		
Chromium	<.06		
Mercury		<.001 (7/28/81)	
Lead	<.1		
Iron	.12		
Manganese	<.02		
Zinc	.05		
Copper	2.15		
Cadmium	<.01		
Barium	<.1		
Silver	<.03		
Sodium	6.54		
Arsenic	<.005		
Selenium	<.005		
Benzene	<.001		
Toluene	<.001		
Ethylbenzene	<.001		
Xylene	<.001		

Note: All results expressed as parts per million.

Reference 7
93/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. SITTON SEPTIC

Parameter	5/27/81	6/19/81
Total Coliforms	<2	
Fecal Coliforms	<2	
PH	6.2	6.2
Hardness	44	34
Sulfate	27.5	
TDS	84	109
Nitrite & Nitrate	.5	.5
MBAS	.02	.03
Phenols	.004	
BOD	1.5	
COD	4.4	
Chloride	11	14
Odor	<1	
Fluoride		
Cyanide		
Chromium	<.06	
Mercury		
Lead	<.1	
Iron	1.15	
Manganese	.05	
Zinc	.28	
Copper	<.03	
Cadmium	<.01	
Barium	<.1	
Silver	<.03	
Sodium	8.73	
Arsenic		
Selenium		
Benzene	<.001	
Toluene	<.001	
Ethylbenzene	<.001	
Xylene	<.001	

Note: All results expressed as parts per million.

Reference 7
94/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. PIERSON

Parameter	5/27/81
Total Coliforms	<2
Fecal Coliforms	<2
PH	5.5
Hardness	13
Sulfate	6.3
TDS	42
Nitrite & Nitrate	<.01
MBAS	.02
Phenols	.005
BOD	1.8
COD	2.8
Chloride	6
Odor	3
Fluoride	<.02
Cyanide	.12
Chromium	<.06
Mercury	
Lead	<.1
Iron	.08
Manganese	1.9
Zinc	.04
Copper	<.03
Cadmium	<.01
Barium	<.1
Silver	<.03
Sodium	7.3
Arsenic	<.005
Selenium	<.005
Benzene	<.001
Toluene	<.001
Ethylbenzene	<.001
Xylene	<.001

Note: All results expressed as parts per million.

Reference 7
95/99

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. CONNAGHAN

Parameter	5/27/81
Total Coliforms	<2
Fecal Coliforms	<2
PH	5.9
Hardness	6
Sulfate	
TDS	21
Nitrite & Nitrate	.06
MBAS	<.01
Phenols	
BOD	
COD	
Chloride	2
Odor	
Fluoride	
Cyanide	
Chromium	
Mercury	
Lead	
Iron	
Manganese	
Zinc	
Copper	
Cadmium	
Barium	
Silver	
Sodium	
Arsenic	
Selenium	
Benzene	<.001
Toluene	<.001
Ethylbenzene	<.001
Xylene	<.001

Note: All results expressed as parts per million.

Reference 7
96/18

NORTHERN LANDFILL SAMPLING

WATER TESTIN PROGRAM

SAMPLE IDENTIFICATION: WELL NO. NOWAK

Parameter	5/27/81	6/19/81
Total Coliforms	<2	
Fecal Coliforms	<2	
PH	5.5	6.2
Hardness	3	3
Sulfate	1.5	
TDS	17	26
Nitrite & Nitrate	.07	.14
MBAS	.01	.02
Phenols	<.001	
BOD	.01	
COD	2.4	
Chloride	2	4
Odor	<1	
Fluoride	<.02	
Cyanide	<.05	
Chromium	<.06	
Mercury		
Lead	<.1	
Iron	.76	
Manganese	<.02	
Zinc	.06	
Copper	.24	
Cadmium	<.01	
Barium	<.1	
Silver	<.03	
Sodium	4.7	
Arsenic	<.005	
Selenium	<.005	
Benzene	<.001	
Toluene	<.001	
Ethylbenzene	<.001	
Xylene	<.001	

Note: All results expressed as parts per million.

Reference 7

97/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. RUZICKA

Parameter	5/27/81
Total Coliforms	<2
Fecal Coliforms	<2
PH	5.6
Hardness	2
Sulfate	
TDS	16
Nitrite & Nitrate	<.01
MBAS	.02
Phenols	
BOD	
COD	
Chloride	2
Odor	
Fluoride	
Cyanide	
Chromium	
Mercury	
Lead	
Iron	
Managenese	
Zinc	
Copper	
Cadmium	
Barium	
Silver	
Sodium	
Arsenic	
Selenium	
Benzene	<.001
Toluene	<.001
Ethylbenzene	<.001
Xylene	<.001

Note: All results expressed as parts per million.

Reference 7/98/98

NORTHERN LANDFILL SAMPLING

WATER TESTING PROGRAM

SAMPLE IDENTIFICATION: WELL NO. JANORA

Parameter	5/27/81
Total Coliforms	<2
Fecal Coliforms	<2
PH	6.2
Hardness	7
Sulfate	
TDS	15
Nitrite & Nitrate	.04
MBAS	.02
Phenols	
BOD	
COD	
Chloride	1
Odor	
Fluoride	
Cyanide	
Chromium	
Mercury	
Lead	
Iron	
Manganese	
Zinc	
Copper	
Cadmium	
Barium	
Silver	
Sodium	
Arsenic	
Selenium	
Benzene	<.001
Toluene	<.001
Ethylbenzene	<.001
Xylene	<.001

Note: All results expressed as parts per million.

REFERENCE NO. 8

Reference 8/1/17

LAKEWOOD TOWNSHIP

MONITORING WELLS #1 - 7

W. C. SERVICES, INC. JOB #20726

Reference 8 2/17

LAKEWOOD TOWNSHIP

MONITORING WELLS #1 - 7

W. C. SERVICES, INC. JOB #20726

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Coord: 2941316

Form DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 2916052

APPLICATION NO. _____

COUNTY Ocean

FOR MONITORING PURPOSES ONLY.

WELL RECORD

1. OWNER LAKEWOOD TOWNSHIP ADDRESS 231-3RD STREET

Owner's Well No. #1 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 1- Block: 522 Municipality Lakewood Twp.

DATE COMPLETED 3/19/86 DRILLER W.C. SERVICES, INC.

4. DIAMETER: Top 8-3/4 inches Bottom 8-3/4 inches TOTAL DEPTH 56 Feet

CASING: Type PVC Diameter 4 Inches Length 38 Feet

6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 20 Feet

Range in Depth { Top 36 Feet / Bottom 56 Feet } Geologic Formation _____

Tail Piece: Diameter None Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 3/19/86 Yield 15 Gallons per minute

Static water level before pumping 44 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type None Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No _____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG See Attached Are samples available? _____

(Give details on back of sheet or on seperate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Drillers Log

14. DATA OBTAINED BY W. C. SERVICES, INC./John O'Brien Date 4/27/86

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Reference 8 4/17

FORM DWR-138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 2916053

APPLICATION NO. _____

COUNTY Ocean

WELL RECORD

1. OWNER LAKEWOOD TOWNSHIP ADDRESS 231-3rd STREET
Owner's Well No. #2 MW SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Lot: 1 - Block: 522 Municipality: Lakewood Twp.
3. DATE COMPLETED 3/21/86 DRILLER W. C. SERVICES, INC.
4. DIAMETER: Top 8-3/4 inches Bottom 8-3/4 inches TOTAL DEPTH 28 Feet
5. CASING: Type PVC Diameter 4 Inches Length 11 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 20 Feet
Range in Depth { Top 8 Feet / Bottom 28 Feet } Geologic Formation _____
Tail Piece: Diameter None Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 3/21/82 Yield 15 Gallons per minute
Static water level before pumping 14 Feet below surface
Pumping level _____ feet below surface after _____ hours pumping
Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
How pumped _____ How measured _____
Observed effect on nearby wells. _____
9. PERMANENT PUMPING EQUIPMENT:
Type None Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG See Attached Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA Drillers Log
14. DATA OBTAINED BY W. C. SERVICES, INC./John O'Brien Date 4/27/86

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Reference 8 5/17

Coord: 2941316

Form DWR- 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 2916054

APPLICATION NO. _____

COUNTY Ocean

WELL RECORD

FOR MONITORING PURPOSES ONLY

1. OWNER LAKEWOOD TOWNSHIP ADDRESS 231-3RD STREET

Owner's Well No. #3 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 1- Block: 522 Municipality: Lakewood Twp.

3. DATE COMPLETED 3/23/86 DRILLER W.C. SERVICES, INC.

4. DIAMETER: Top 8-3/4 inches Bottom 8-3/4 inches TOTAL DEPTH 34-6 Feet

5. CASING: Type PVC Diameter 4 Inches Length 17 Feet

6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 20 Feet

Range in Depth { Top 14-6 Feet / Bottom 34-6 Feet } Geologic Formation _____

Tail Piece: Diameter None Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 3/27/86 Yield 15 Gallons per minute

Static water level before pumping 14 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type None Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG See Attached Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Drillers Log

14. DATA OBTAINED BY W. C. SERVICES, INC./John O'Brien Date 4/27/86

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Reference 8 6/17

Coord: 2941316

DWR- 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 2916055

APPLICATION NO. _____

COUNTY Ocean

FOR MONITORING PURPOSES ONLY

WELL RECORD

1. OWNER LAKEWOOD TOWNSHIP ADDRESS 231-3RD STREET

Owner's Well No. #4 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 1- | Block: 522 Municipality: Lakewood Twp.

3. DATE COMPLETED 4/1/86 DRILLER W.C. SERVICES, INC.

4. DIAMETER: Top 8-3/4 inches Bottom 8-3/4 inches TOTAL DEPTH 18 Feet

5. CASING: Type PVC Diameter 4 Inches Length 21 Feet

6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 20 Feet

Range in Depth { Top 18 Feet / Bottom 38 Feet } Geologic Formation _____

Tail Piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 4/1/86 Yield 15 Gallons per minute

Static water level before pumping 22 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type None Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes ____ No ____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG See Attached Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Drillers Log

DATA OBTAINED BY W. C. SERVICES, INC/John O'Brien Date 4/27/86

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Reference 8 7/17

Form DWR- 138
11/80

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

Coord: 2941316

PERMIT NO. ~~2916~~056

APPLICATION NO. _____

COUNTY Ocean

WELL RECORD

FOR MONITORING PURPOSES ONLY

1. OWNER LAKEWOOD TOWNSHIP ADDRESS 231-3RD STREET
Owner's Well No. #5 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Lot: 1- Block: 522 Municipality: Lakewood Twp.
3. DATE COMPLETED 4/2/86 DRILLER W.C. SERVICES, INC.
4. DIAMETER: Top 8-3/4 inches Bottom 8-3/4 inches TOTAL DEPTH 47 Feet
5. CASING: Type PVC Diameter 4 Inches Length 30 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 20 Feet
Range in Depth { Top 27 Feet / Bottom 47 Feet Geologic Formation _____
Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 4/2/86 Yield 15 Gallons per minute
Static water level before pumping 31 Feet below surface
Pumping level _____ feet below surface after _____ hours pumping
Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
How pumped _____ How measured _____
Observed effect on nearby wells _____
PERMANENT PUMPING EQUIPMENT:
Type None Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily
11. QUALITY OF WATER _____ Sample: Yes ____ No ____
Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG See Attached Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
SOURCE OF DATA Drillers Log
DATA OBTAINED BY W. C. SERVICES, INC / John O'Brien Date 4/27/86

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Reference 8 8/17

Form DWR- 138
11/80

Coord: 2941316

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 2916057

APPLICATION NO. _____

COUNTY Ocean

WELL RECORD

1. OWNER LAKEWOOD TOWNSHIP ADDRESS 231-3RD STREET
Owner's Well No. #6 SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Lot: 1- Block: 522 Municipality: Lakewood Twp.
3. DATE COMPLETED 3/27/86 DRILLER W.C. SERVICES, INC.
4. DIAMETER: Top 8-3/4 inches Bottom 8-3/4 inches TOTAL DEPTH 48 Feet
5. CASING: Type PVC Diameter 4 Inches Length 31 Feet
6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 20 Feet
Range in Depth { Top 28 Feet / Bottom 48 Feet Geologic Formation _____
Tail Piece: Diameter _____ Inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface
Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 3/27/80 Yield 15 Gallons per minute
Static water level before pumping 36 Feet below surface
Pumping level _____ feet below surface after _____ hours pumping
Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
How pumped _____ How measured _____
Observed effect on nearby wells _____
PERMANENT PUMPING EQUIPMENT:
Type None Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches
10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily
11. QUALITY OF WATER _____ Sample: Yes _____ No _____
Taste _____ Odor _____ Color _____ Temp. _____ °F.
12. LOG See Attached Are samples available? _____
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)
13. SOURCE OF DATA Drillers Log
14. DATA OBTAINED BY W. C. SERVICES, INC./John O'Brien Date 3/27/86

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Reference 8 4/17

Form DWR-138
11/80

Coord: 2941316

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 2916058

APPLICATION NO. _____

COUNTY Ocean

WELL RECORD

FOR MONITORING PURPOSES ONLY

1. OWNER LAKEWOOD TOWNSHIP ADDRESS 231-3RD STREET

Owner's Well No. #7 SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Lot: 1- Block: 522 Municipality: Lakewood Twp.

DATE COMPLETED 3/25/86 DRILLER W.C. SERVICES, INC.

4. DIAMETER: Top 8-3/4 inches Bottom 8-3/4 inches TOTAL DEPTH 32-6 Feet

CASING: Type PVC Diameter 4 Inches Length 15-6 Feet

6. SCREEN: Type PVC Size of Opening .020 Diameter 4 Inches Length 20 Feet

Range in Depth { Top 12-6 Feet / Bottom 32-6 Feet } Geologic Formation _____

Tail Piece: Diameter None Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 3/25/86 Yield 15 Gallons per minute

Static water level before pumping 17 Feet below surface

Pumping level _____ feet below surface after _____ hours pumping

Drawdown _____ Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How pumped _____ How measured _____

Observed effect on nearby wells _____

9. PERMANENT PUMPING EQUIPMENT:

Type _____ Mfrs. Name _____

Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____

Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet

Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size _____ Inches

10. USED FOR Monitoring AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }

11. QUALITY OF WATER _____ Sample: Yes _____ No _____

Taste _____ Odor _____ Color _____ Temp. _____ °F.

12. LOG See Attached Are samples available? _____

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

13. SOURCE OF DATA Drillers Log

DATA OBTAINED BY W. C. SERVICES, INC./John O'Brien Date 4/27/86

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Reference 8 10/17

WR-133 (1/84)

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
TRENTON, N.J.

Permit No. 29-16052-
29-16058

Mail to
Water Allocation
CN 029
Trenton, N.J. 08625

PERMIT TO DRILL WELL 14

VALID ONLY AFTER APPROVAL BY THE D.E.P.

29 of 3 16

Owner LAKEWOOD TWP.
Address 231 - 3rd Street
Lakewood, NJ

Driller W. C. SERVICES, INC.
Address 664 So. Evergreen Avenue
Woodbury, New Jersey 08096

Name of Facility Lakewood Twp. Landfill
Address Lakewood, NJ
Kennedy Avenue

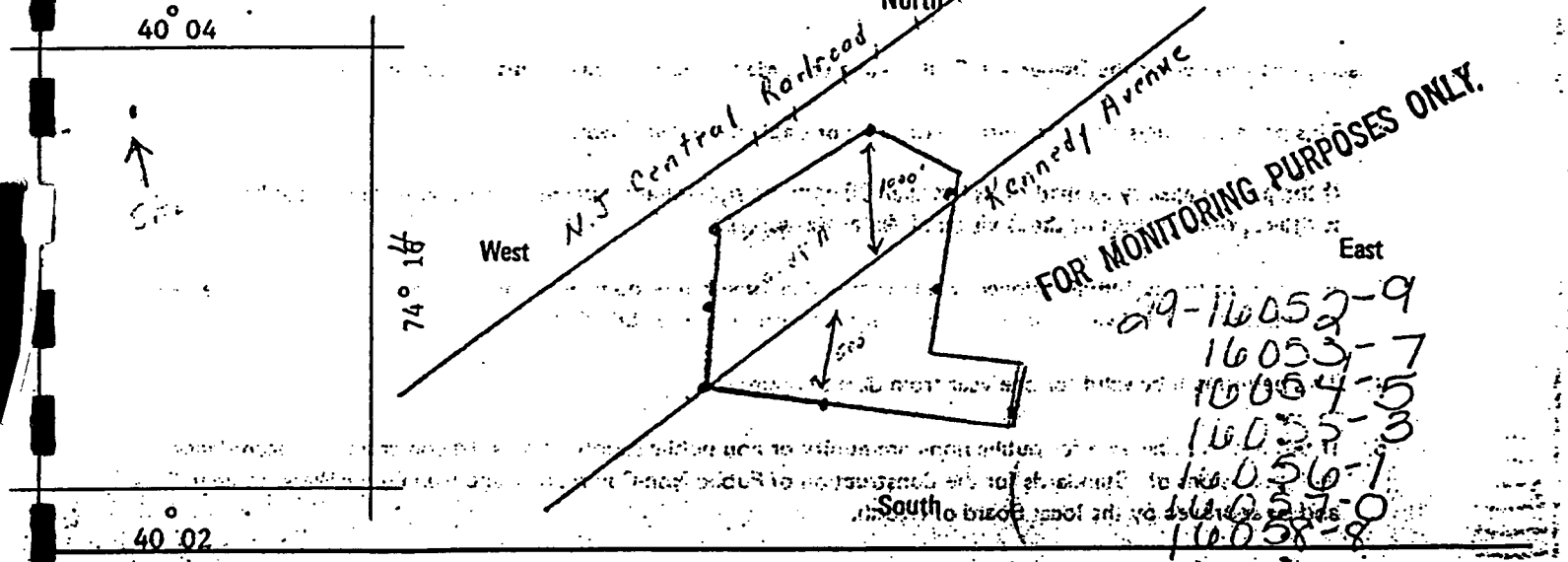
Diameter of Well	4 Inches	Proposed Depth of Well	50 Feet
Proposed Capacity of Pump	n/a GPM	Method of Drilling (cable-tool, rotary, etc.)	Rotary
Use of Well (See Reverse)		Monitor	

LOCATION OF WELL

Lot #	Block #	Municipality	County
1 thru 6	522	Lakewood Twp.	Ocean

State Atlas Map No. 29

Draw sketch showing distance and relations of well site to nearest public roads, streets, septic systems, etc.



FOR MONITORING PURPOSES ONLY.

29-16052-9
16053-7
16054-5
16055-3
16056-1
16057-0
16058-8

SEE REVERSE SIDE for IMPORTANT PROVISIONS AND REGULATIONS pertaining to this permit. APPROVAL of this permit is made SUBJECT TO acceptance of and compliance with the following ADDITIONAL CONDITIONS:

- ☐ Permit issued in accordance with provisions of letter of transmittal dated _____
- ☐ Authorization by rule under N.J.A.C. 7:14A-1 et seq.
- ☐ Samples of cuttings required every _____ feet.
- ☐ The results of a volatile organic scan mut be obtained prior to using the water and submitted to _____.
- ☐ Domestic Potable Water Supply - The service line for water from the public community water supply system shall be turned off at the curb cock, and the meter shall be removed by the water purveyor.
- ☐ Domestic Irrigation Supply - No piping from the well for which the permit applies shall enter any building.
- ☐ Industrial/Commercial Supply - A physical connection permit shall be obtained pursuant to the provisions of N.J.A.C. 7:10-10-1 et seq., and a vigorous cross connections control program shall be instituted and maintained within the premises.
- ☐ Heat Pump Wells - Wells must be 50 feet apart and the water must be returned to the same aquifer as the production well.
- ☐ _____

This Space for Approval Stamp

WELL PERMIT
APPROVED
FEB 27 1986
DEPT. ENV. PROTECTION
DIV. OF WATER RESOURCES
WATER ALLOCATION

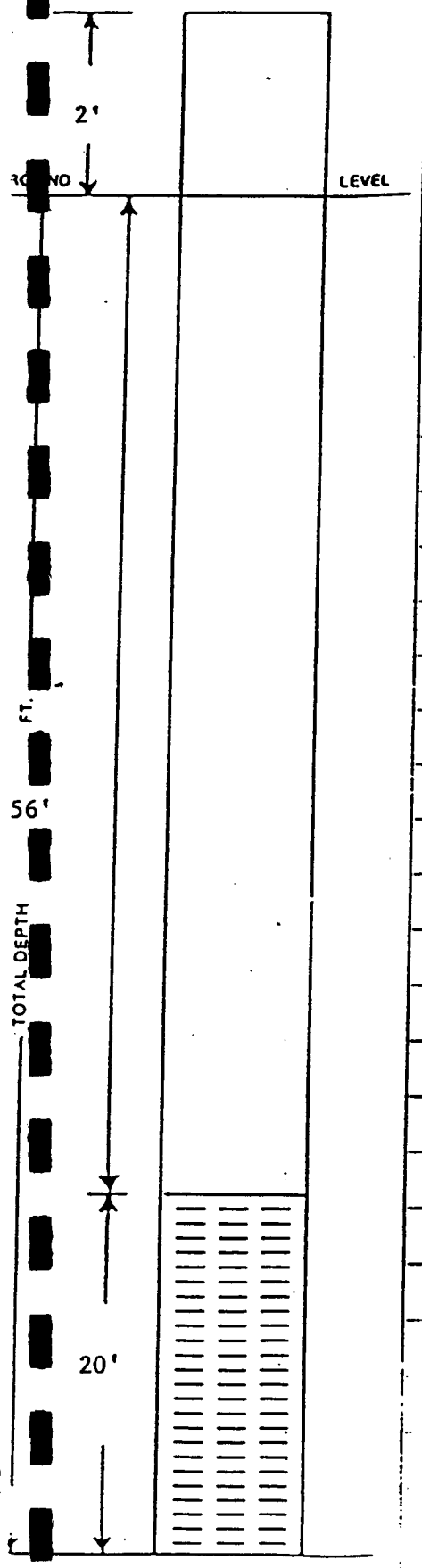
In compliance with R.S. 58:4A-14, application is made for a permit to drill a well as described above.

Date 2/24/86 Signature of Owner _____

Reference 8 11/17

W. C. SERVICES, INC.

SINGLE CASED WELL

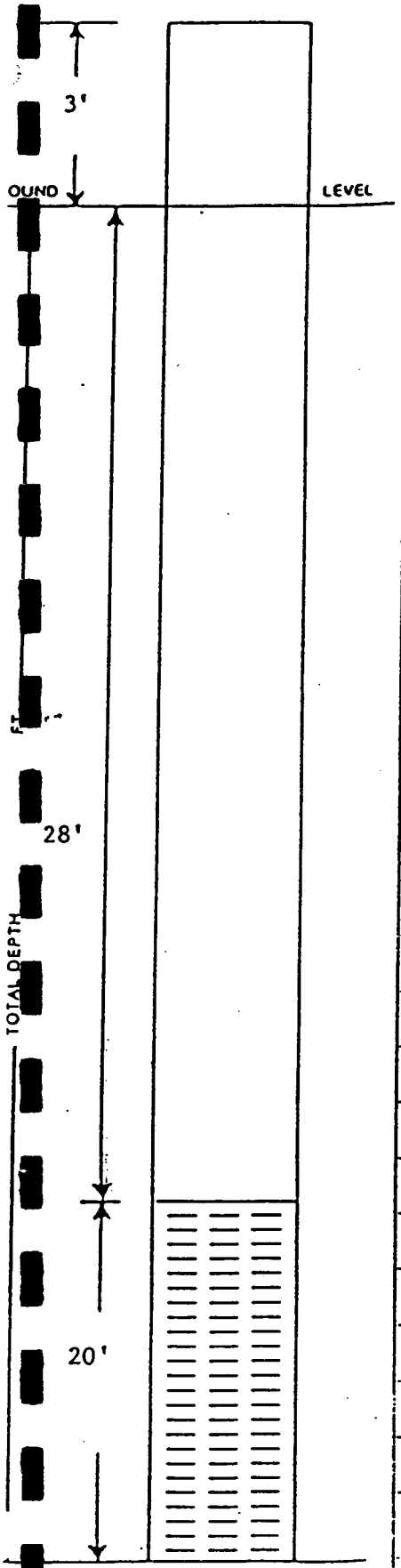


WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
	0 to 56	Lakewood Landfill
	0	Location Lakewood, New Jersey
Orange & brown sand	0 - 5	Well No. #1
Orange & white light	5 - 25	State Permit 2916052-9
sand		Job No. 20726
White & grey	25 - 30	Test Pumped (Hrs.)
		Capacity (GPM)
Orange & brown	30 - 50	Static Level 44
Sand w. wilts		Pumping Level
Coarse gravel w-	50 - 47	Datum
Coarse white sand		Specific Capacity
		Diameter of Casing 4"
		Depth of Well (Ground) 56'
		Depth to Gravel 31'
		Gravel Size #1
		Length of Casing & Screen 58'
		Screen Material PVC
		Screen Mfg. —
		Screen Dia. 4"
		Length of Screen 20'
		Top of Screen Fitting Flush Joint
		Bottom of Screen Fitting Screwed Plug
		Slot Size
		Seal Material Ben. Pellets & Cement Bentonite 1 20 Gal.
		Quantity GL
		Depth of Seal Material #7 Auger
		Drilling Machine 3/19/86
		Date Well Completed Michael J. Kavlunas

Reference # 12/17

W. C. SERVICES, INC.

SINGLE CASED WELL

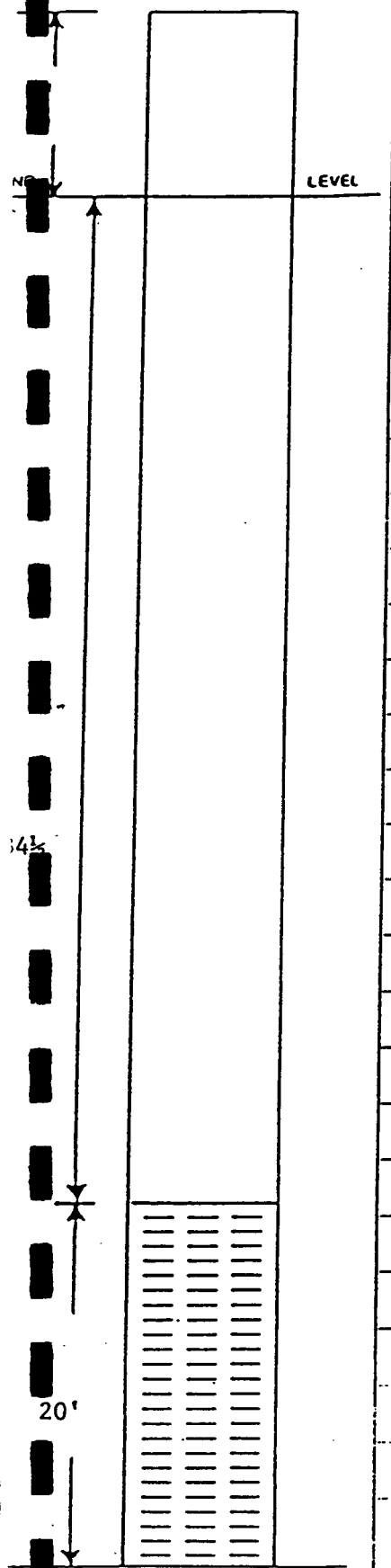


WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
	0 to 28'	Lakewood Landfill
Orange	0 - 7	Location: Lakewood, New Jersey
Sand		Well No.: #2 MW
Orange & light	7 - 15	State Permit: 2916053-7
Brown sand		Job No.: 20726
Orange & tan	15 - 28	Test Pumped (Hrs.): 1 hour
Sand		Capacity (GPM): 15 GPM
		Static Level: 14'
		Pumping Level:
		Datum:
		Specific Capacity:
		Diameter of Casing: 4"
		Depth of Well (Ground): 28'
		Depth to Gravel: 5'
		Gravel Size: #1
		Length of Casing & Screen: 31'
		Screen Material: PVC
		Screen Mfg.:
		Screen Dia.: 4"
		Length of Screen: 20'
		Top of Screen Fitting: Flush Jt.
		Bottom of Screen Fitting: Screw plug
		Slot Size: .020
		Seal Material: Bentonite cement slurry
		Quantity: 6 bags
		Depth of Seal Material: GL
		Drilling Machine: #7 Auger
		Date Well Completed: 3-21-86
		Driller:

Reference 8 13/17

W. C. SERVICES, INC.

SINGLE CASED WELL



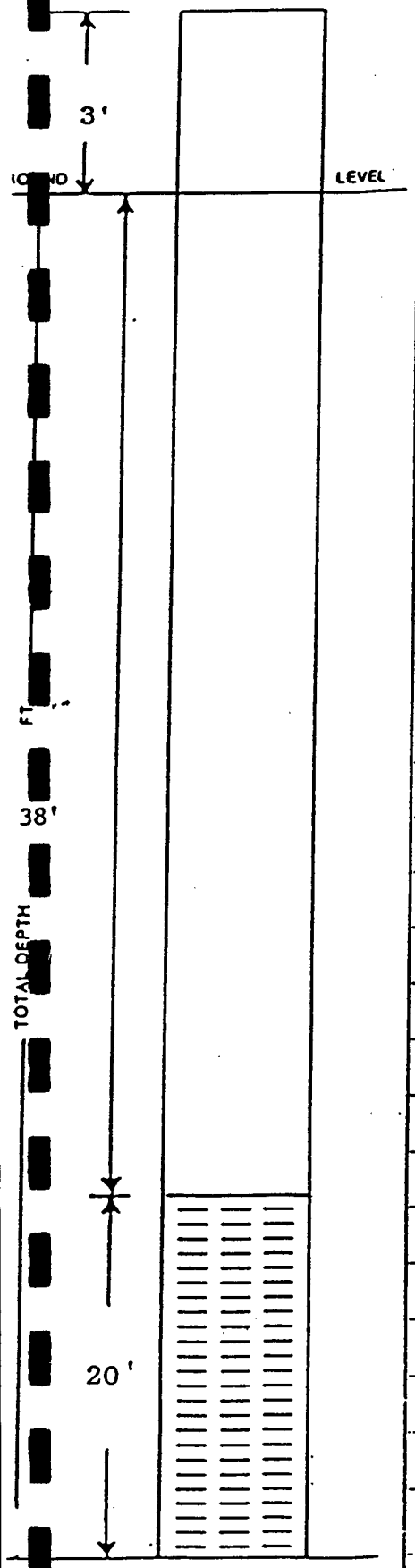
WELL LOG	FEET FROM GROUND SURFACE 0 to 34½
Gravel Orange sand	0 - 6
White & Orange sand	6 - 14
Yellow Sand	14 - 20
Tan & light sand	20 - 34

NAME OF OWNER	Lakewood Landfill
Location	Lakewood, NJ
Well No	#3
State Permd	2916054-5
Job No.	20746
Test Pumped (Hrs.)	1 hr.
Capacity (GPM)	15 GPM
Static Level	14'
Pumping Level	
Datum	
Specific Capacity	
Diameter of Casing	4"
Depth of Well (Ground)	34½
Depth to Gravel	11'
Gravel Size	#1
Length of Casing & Screen	37'
Screen Material	Slot PVC
Screen Mfg.	
Screen Dia.	4"
Length of Screen	20'
Top of Screen Fitting:	Flush
Bottom of Screen Fitting	Screw Cap
Slot Size	.020
Seal Material	cement / slurry
Quantity	880 lbs.
Depth of Seal Material	G.L.
Drilling Machine	#7 Auger
Date Well Completed	3-23-86
Driller	

Reference 8 14/17

W. C. SERVICES, INC.

SINGLE CASED WELL

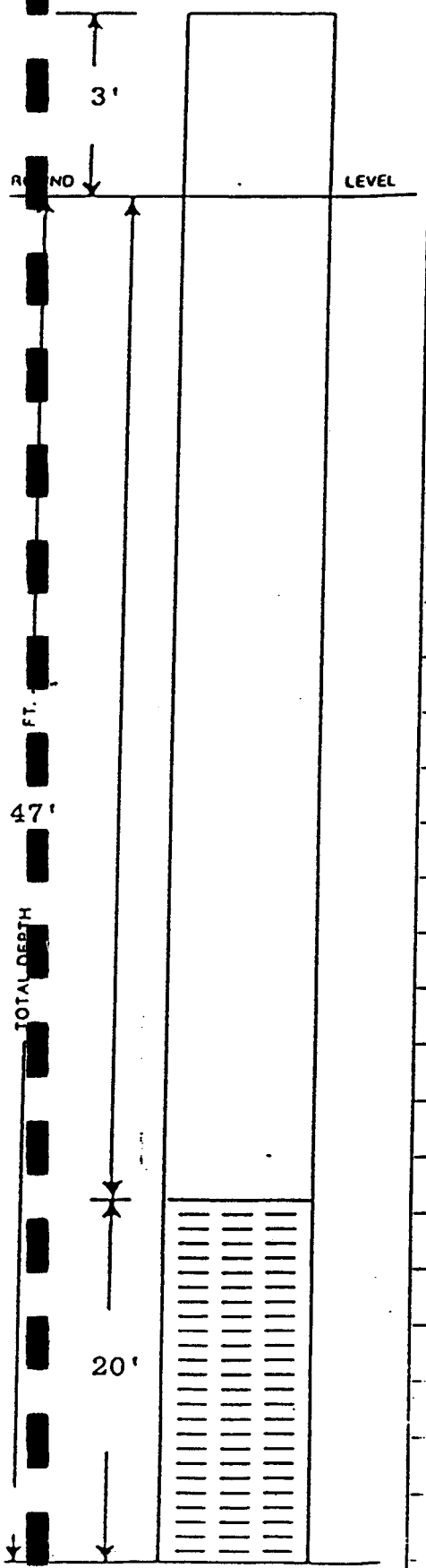


WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
	0 to 38	Lakewood Landfill
Yellow & Purple	0-20	Location Lakewood, NJ
Sand		Well No #4
Light & Tan	20-38	State Permit 2916055-3
Sand		Job No 20726
		Test Pumped (Hrs.) 1
		Capacity (GPM) 15
		Static Level 22'
		Pumping Level
		Datum
		Specific Capacity
		Diameter of Casing 4"
		Depth of Well (Ground) 38'
		Depth to Gravel 15
		Gravel Size #1
		Length of Casing & Screen 41'
		Screen Material Slot PVC
		Screen Mfg.
		Screen Dia. 4"
		Length of Screen 20'
		Top of Screen Fitting F.J.
		Bottom of Screen Fitting Screw Cap
		Slot Size .20
		Seal Material Ben-Cement
		Quantity 1000 lbs
		Depth of Seal Material GL
		Drilling Machine #7
		Date Well Completed 4/1/86
		Driller M. J. Kavlunas

Reference 15/17

W. C. SERVICES, INC.

SINGLE CASED WELL

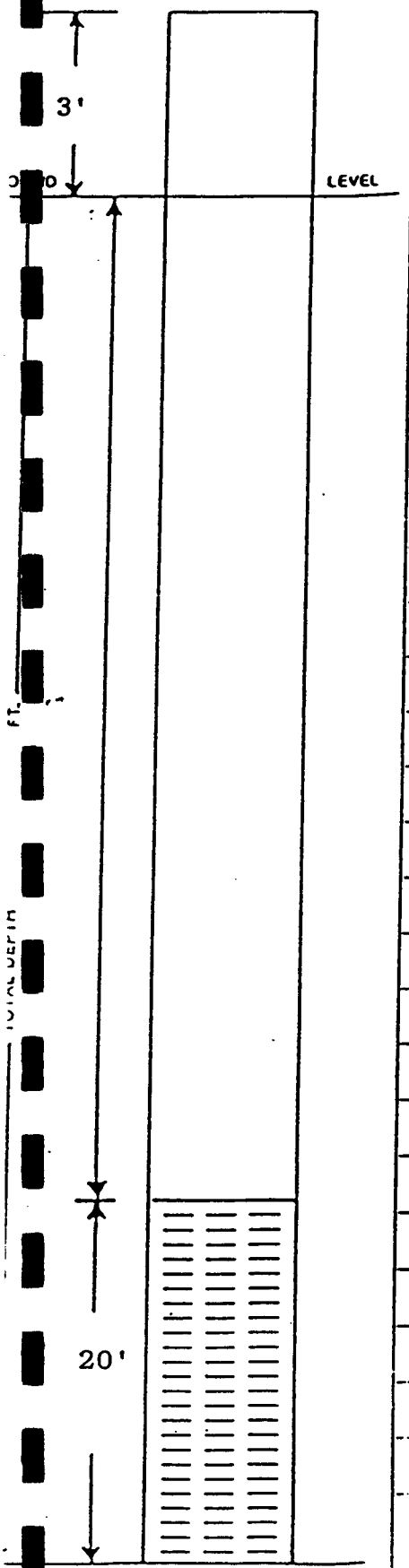


WELL LOG	FEET FROM GROUND SURFACE	NAME OF OWNER
0-20	0 to 47'	Lakewood Landfill
Yellow sand	0-20	Location Lakewood, NJ
yellow & purple	20-30	Well No. #5
sand		State Permit 2916056-1
Clay	30-31	Job No. 20726
Tan & light	31-48	Test Pumped (Hrs.) 1
sand		Capacity (GPM) 15
		Static Level 31'
		Pumping Level
		Datum
		Specific Capacity
		Diameter of Casing 4"
		Depth of Well (Ground) 47'
		Depth to Gravel 24
		Gravel Size #1
		Length of Casing & Screen 50'
		Screen Material Slot PVC
		Screen Mfg.
		Screen Dia. 4"
		Length of Screen 20'
		Top of Screen Fitting F.J.
		Bottom of Screen Fitting Screw Cap
		Slot Size .20
		Seal Material Ben-Cement
		Quantity G.L.
		Depth of Seal Material #7 Auger
		Drilling Machine 4/2/86
		Date Well Completed M.J. Kavlunas

Reference 8 16/17

W. C. SERVICES, INC.

SINGLE CASED WELL

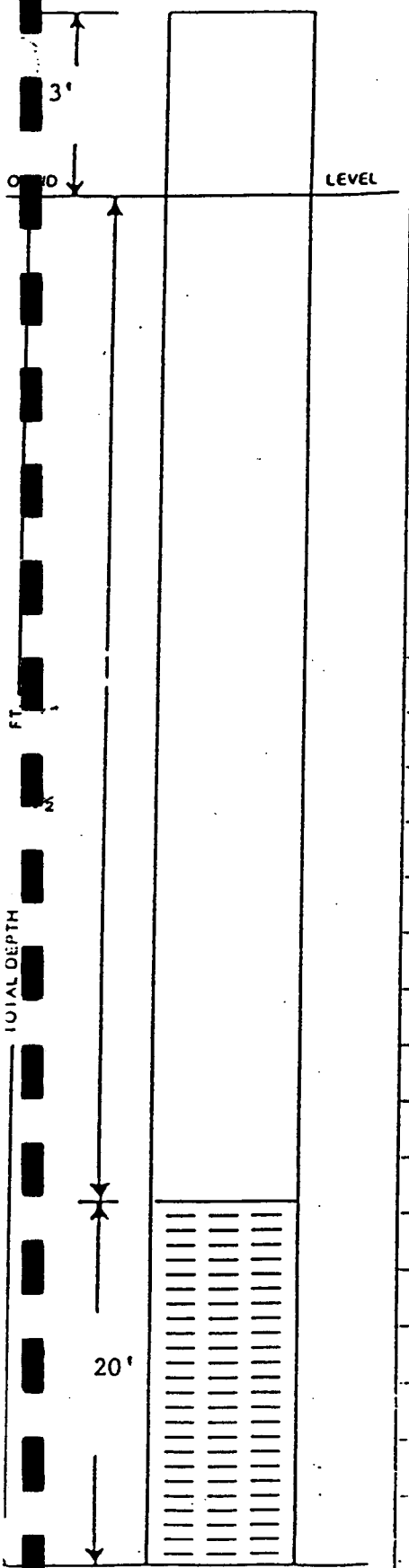


WELL LOG	FEET FROM GROUND-SURFACE 0 to 48	NAME OF OWNER Lakewood Landfill
Orange & yellow sand	0-30	Location Lakewood, NJ
		Well No #6
		State Permd 2916957-0
Orange w-streaks purple	30-34	Job No. 20726
		Test Pumped (Hrs.) 1 Airlift
		Capacity (GPM) 15 GPM
Light & zan sand	35-50	Static Level 36'
		Pumping Level
		Datum
		Specific Capacity
		Diameter of Casing 4"
		Depth of Well (Ground) 48'
		Depth to Gravel 25'
		Gravel Size #1
		Length of Casing & Screen 51'
		Screen Material PVC slot
		Screen Mfg.
		Screen Dia. 4"
		Length of Screen 20'
		Top of Screen Fitting F.J.
		Bottom of Screen Fitting Screw Cap
		Slot Size .020
		Seal Material Ben-Cement
		Quantity 2000 lbs
		Depth of Seal Material G.L.
		Drilling Machine #7
		Date Well Completed 3/27/86

Reference 8 17/17

W. C. SERVICES, INC.

SINGLE CASED WELL



WELL LOG	FEET FROM GROUND SURFACE
	0 to 32½
Gray Sand	0 – 3
Yellow w/streaks	3 – 12
Purple sand	
Sandy clay & tan	12 – 17
sand	
Tan & white	17 – 32
sand	

NAME OF OWNER: Lakewood Landfill

Location	Lakewood, NJ
Well No	#7
State Permit	2916058-8
Job No.	20726
Test Pumped (Hrs.)	1 hour
Capacity (GPM)	15
Static Level	17'
Pumping Level	
Datum	
Specific Capacity	
Diameter of Casing	4"
Depth of Well (Ground)	32½'
Depth to Gravel	10'
Gravel Size	#1 morie
Length of Casing & Screen	35½
Screen Material	slotted PVC
Screen Mfg.	
Screen Dia.	4"
Length of Screen	20'
Top of Screen Fitting	Flush jt.
Bottom of Screen Fitting	Screw cap
Slot Size	.020
Seal Material	Bentonite cement
Quantity	900 lbs.
Depth of Seal Material	GL
Drilling Machine	#7 Auger
Date Well Completed	3/25/86
Driller	

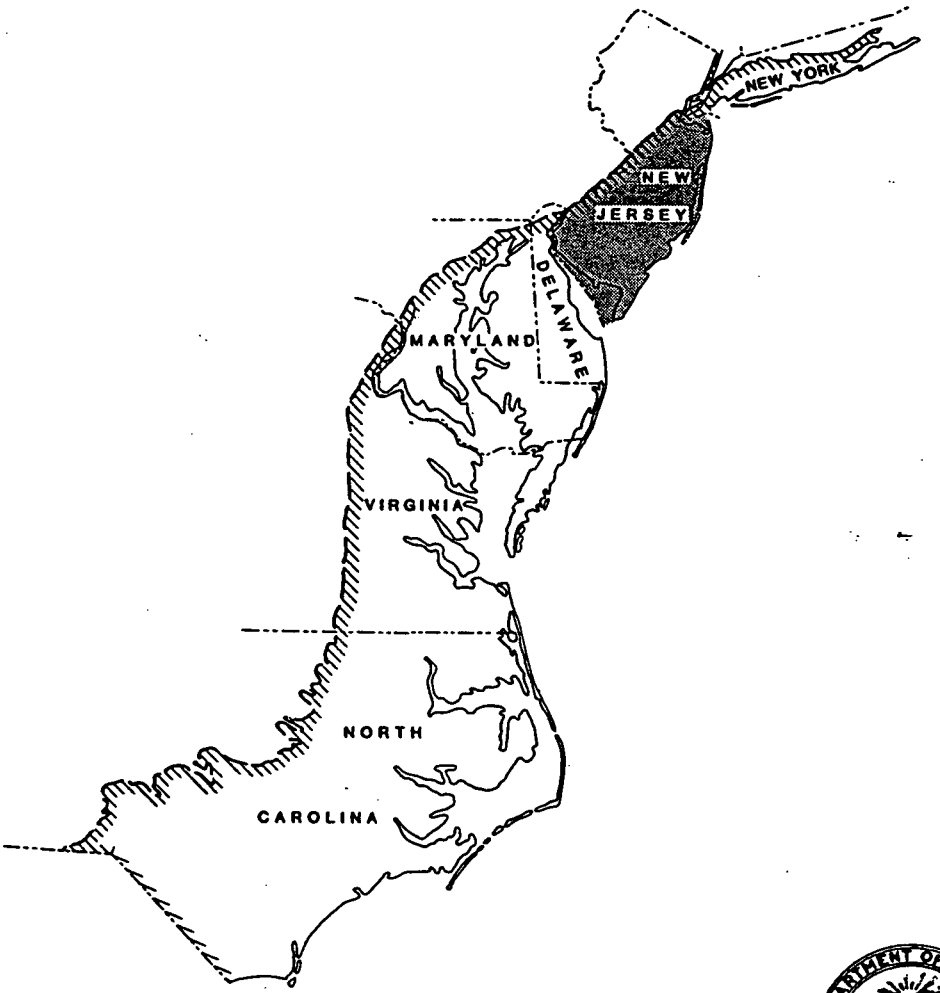
REFERENCE NO. 9

Reference 9 1/12

HYDROGEOLOGIC FRAMEWORK OF THE NEW JERSEY COASTAL PLAIN

REGIONAL AQUIFER-SYSTEM ANALYSIS

U.S. GEOLOGICAL SURVEY
Open-File Report 84-730



Reference 9 2/12

HYDROGEOLOGIC FRAMEWORK OF THE NEW JERSEY COASTAL PLAIN

By Otto S. Zapecza

Open-File Report 84-730

Trenton, New Jersey
1984

Reference 9 3/12

UNITED STATES DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

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PLATES--Continued

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PLATES--Continued

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and structure contour maps of this unit are not given in this report. Tops and thicknesses of the Rio Grande water-bearing zone can be calculated from the hydrogeologic sections.

The Rio Grande water-bearing zone is utilized mainly in southern Cape May County, where aquifer thicknesses can exceed 100 ft. It is generally less than 40 ft thick throughout much of the coastal areas in southern Ocean and Atlantic Counties. The aquifer is seldom used outside of southern Cape May County and is of minor importance. Therefore, in this report, the Rio Grande water-bearing zone has been included as part of the confining bed overlying the 800-foot sand shown on plate 22.

Kirkwood-Cohansey Aquifer System

The Kirkwood-Cohansey aquifer system is predominantly a water-table aquifer that underlies an area of approximately 3,000 mi^2 southeast of the updip limit of the outcrop of the Kirkwood Formation. This aquifer system is composed of the Kirkwood Formation, Cohansey Sand, and, depending on location, can include overlying deposits of the Beacon Hill Gravel, Bridgeton Formation, and Cape May Formation (Rhodehamel, 1973). The Kirkwood-Cohansey aquifer system is confined by overlying Pleistocene deposits on the peninsular part of Cape May County.

The lithology of the Kirkwood Formation, as indicated previously, is variable. Along coastal areas thick clay beds are dominant with interbedded zones of sand and gravel. In the subsurface, updip from the coast, fine to medium sand and silty sand are common, and regionally extensive clay beds occur only in the basal part of the formation.

The Cohansey Sand, also of Miocene age, is coarser grained than the underlying Kirkwood Formation. It is predominantly a light-colored quartz sand containing minor amounts of pebbly sand, fine- to coarse-grained sand, silty and clayey sand, and interbedded clay (Rhodehamel, 1973, p. 24). Some local clay beds within the Cohansey Sand are relatively thick. Locally, perched water tables and semiconfined conditions can exist in the Kirkwood-Cohansey aquifer system.

Overlying the Cohansey Sand are the Beacon Hill Gravel and the Bridgeton Formation, both considered to be Miocene fluvial deposits (Owens and Minard, 1979). The Beacon Hill Gravel overlies the Cohansey Sand only in remnant patches on the highest hills between Clarksburg, Monmouth County, and Warren Grove, Ocean County, where it can be as much as 40 ft thick (Owens and Minard, 1979, p. D6). The coarse-grained sand and gravel of the Bridgeton Formation are more widespread and can generally add 30 to 50 ft of thickness to the aquifer system in parts of Camden, Gloucester, Salem, Cumberland, Atlantic, and Cape May Counties (Owens and Minard, 1979, p. D14).

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Throughout most of Cape May County, the Pleistocene Cape May Formation directly overlies the Cohansey Sand. Gill (1962, p. 21) divided the Cape May Formation into four distinct environmental facies. In order of deposition they are: estuarine sand, estuarine clay, marine sand, and deltaic sand. Gill (1962, fig. 2) has shown that in the northern half of Cape May County and along the coast as far south as Stone Harbor, the Cohansey Sand is in hydraulic connection with the overlying marine and deltaic sand facies. The marine sand facies of the Cape May Formation adds as much as 100 ft to the thickness of the Kirkwood-Cohansey aquifer system in the northern half of Cape May County. On the peninsular part of Cape May County, the Cohansey Sand is generally in hydraulic connection with the estuarine sand facies but is confined by the overlying estuarine clay facies (Gill, 1962, fig. 2). The estuarine clay facies generally ranges from 25 to 125 ft in thickness (Gill, 1962, p. 27).

The base of the Kirkwood-Cohansey aquifer system is shown on plate 23. The map illustrates two major regional basal surfaces for the water-table aquifer. The two surfaces are differentiated by the double-dashed line representing the approximate westward limit of the major confining bed overlying the Atlantic City 800-foot sand. The basal surface for the Kirkwood-Cohansey aquifer system west of this line is the top of the clay bed lying within the lower part of the Kirkwood Formation. This clay bed, as shown on hydrogeologic sections F-F' (pl. 4) and L-L' (pl. 5), is the updip extension of the confining bed underlying the 800-foot sand, and is probably the equivalent of the Alloway Clay Member of the Kirkwood Formation described by Nemickas and Carswell (1976).

The basal surface east of the double-dashed line is the top of the thick diatomaceous clay bed that overlies the Atlantic City 800-foot sand. The discontinuity in the structure contours on the base of the unconfined system at the double-dashed line is caused by the presence of this clay bed. The base of the aquifer system directly updip from the northwestern limit of the confining bed generally lies more than 350 ft below sea level. At Egg Harbor City, Atlantic County, several miles downdip from the western limit of the confining bed, the base of the water-table aquifer is only 160 ft below sea level. The difference in altitudes of the two basal surfaces of the Kirkwood-Cohansey aquifer system is shown diagrammatically in figure 5.

The thickness of the confining bed underlying the Kirkwood-Cohansey aquifer system west of the double-dashed line is shown on plate 18 as the composite confining bed. If, in more detailed studies, the Vincentown and Piney Point aquifers are considered to be important, the thickness of the confining bed between the base of the unconfined aquifer and these minor aquifers can be calculated by comparing the maps of the tops of the Vincentown (pl. 19) and Piney Point (pl. 20) aquifers with the base of the Kirkwood-Cohansey aquifer system west of the double-dashed line (pl. 23).

It is important to note that the Cohansey Sand is a confined aquifer beneath the peninsular portion of Cape May County. However, on plate 23, structure contours have been extended throughout Cape May County to illustrate the base of the confined Cohansey Sand. Information regarding the water-table system in Cape May County can be found in Gill (1962).

The extent of the confining bed overlying the Atlantic City 800-foot sand partly determines the thickness of the Kirkwood-Cohansey aquifer system. An abrupt change in the thickness of the Kirkwood-Cohansey aquifer system at the double-dashed line is shown on plate 24. The water-table aquifer thickens downdip from less than 50 ft at the Kirkwood outcrop to more than 400 ft near the edge of the upper confining bed of the Atlantic City 800-foot sand. In areas where this clay bed occurs in the subsurface, the aquifer thickness ranges from about 140 ft along the northwestern extent of the clay bed to approximately 400 ft in the Atlantic City area.

The aquifer-thickness map for the Kirkwood-Cohansey aquifer system represents not only the saturated thickness of the water-table aquifer but also the unsaturated section. The thickness of the aquifer at each control point represents the total thickness of the unit calculated by subtracting the depth of the basal confining bed from the altitude of land surface.

SUMMARY AND CONCLUSIONS

The Coastal Plain of New Jersey is a seaward-dipping wedge of unconsolidated sediments that range in age from Cretaceous to Quaternary. These sediments are composed of clay, silt, sand, and gravel and include continental, coastal, and marine-type deposits.

Hydrogeologic units described in this report can differ from formal stratigraphic units because a geologic formation can contain more than one aquifer, a formation may function as an aquifer in one area and as a confining bed in another, or an aquifer or confining bed may be composed of several geologic formations.

The occurrence and configuration of 15 regional hydrogeologic units have been defined within the Coastal Plain of New Jersey based on the interpretation of borehole geophysics data. Structure-contour maps and aquifer thickness maps are provided for nine aquifers listed in ascending order:

1. Lower aquifer of the Potomac-Raritan-Magothy aquifer system
2. Middle aquifer of the Potomac-Raritan-Magothy aquifer system
3. Upper aquifer of the Potomac-Raritan-Magothy aquifer system
4. Englishtown aquifer system
5. Wenonah-Mount Laurel aquifer
6. Vincentown aquifer
7. Piney Point aquifer

Table 3.--Record of wells used to construct the hydrogeologic framework of the New Jersey Coastal Plain--Continued.

Well number	Location		Local well identifier	Municipality	Total depth logged (feet)	Hydrogeologic section (see plate 2)
	Latitude	Longitude				
25-374	400804	740227	SEA GIRT WD 5	SEA GIRT BORO	755	
25-391	400928	740211	SPRING LAKE HIGHTS WD 4	SPRNG LK HGTS BORO	719	L'-A'
25-407	401005	742939	PUNK BROS DEEP WELL	UPPER FREEHOLD TWP	950	
25-428	400823	740455	WALL TWP WD ALLENWOOD 1	WALL TWP	755	
25-429	400834	740834	USGS ALLAIRE STATE PARK C	WALL TWP	575	
25-436	400952	740725	BRISBANE CHILD TREAT CENTER 3-71	WALL TWP	1040	
25-453	402632	741051	UNION BEACH WD 3-77	UNION BEACH BORO	579	A-A'
25-456	402640	740904	INT FLAVOR FRAG 3R	UNION BEACH BORO	582	
25-486	400711	740202	US DEPT OF ENERGY TH 2-78	MANASQUAN BORO	974	L'-A'
25-487	400908	741330	ALDRICH WC TH 4	HOWELL TWP	622	
25-492	401134	741014	ROKEACH & SONS TH	FARMINGDALE BORO	495	
25-493	401231	741127	HOWELL TWP 1-75	HOWELL TWP	843	
25-495	401850	740301	US DEPT OF ENERGY TC-40	EATONTOWN BORO	1003	B-B'
29- 9	393346	741430	BEACH HAVEN WD 8	BEACH HAVEN BORO	656	
29- 19	394829	740535	USGS IS BEACH OBS 3 TW1	BERKELEY TWP	3878	E-E',L'-A'
29- 25	395448	741444	TRANSCONTL GAS TH 20	BERKELEY TWP	1426	
29- 45	400431	740832	BRICK TWP MUA FP 9	BRICK TWP	1807	D-D',K-C'
29- 70	395905	740359	NJ WATER COMPANY NORMANDY 4	DOVER TWP	1500	D-D',L'-A'
29- 85	395929	741421	TOMS RIVER CHEM 84	DOVER TWP	2242	E-E',K-C'
29-118	400200	742110	US NAVY LAKEHURST 32	JACKSON TWP	1732	
29-134	400320	741954	JACKSON TWP MUA SCM 1	JACKSON TWP	1109	E-E'
29-138	400414	742702	USGS COLLIERS MILLS 1	JACKSON TWP	403	
29-233	400742	741639	JACKSON TWP MUA 4	JACKSON TWP	565	
29-238	400819	742625	JACKSON TWP MUA 7	JACKSON TWP	800	D-D',E-E',J-J'
29-240	400847	741531	JACKSON TWP MUA 5	JACKSON TWP	224	
29-425	395323	742255	USGS WEBBS MILLS 2	LACEY TWP	388	L-L'
29-429	400046	741838	LAKEHURST WD 1	LAKEHURST BORO	1017	
29-433	400312	741123	LAKEWOOD TWP MUA SO LKWD 3	LAKEWOOD TWP	720	
29-440	400504	741324	NJ WATER COMPANY LAKEWOOD 10	LAKEWOOD TWP	1614	D-D'
29-441	400505	741114	NJ WATER COMPANY LAKEWOOD OBS	LAKEWOOD TWP	759	
29-449	400614	741157	NJ WATER COMPANY LAKEWOOD 9	LAKEWOOD TWP	740	
29-453	395808	740416	LAVALLETTE WD 4	LAVALLETTE BORO	1467	
29-457	393510	741327	LONG BEACH WC TERRACE 3	LONG BEACH TWP	698	M-M'
29-462	393253	742308	LITTLE EGG HARBOR MUA MYSTIC 3	LITTLE EGG HARBOR TWP	587	
29-464	393428	742202	LITTLE EGG HARBOR MUA MYSTIC 2	LITTLE EGG HARBOR TWP	664	

Table 4.--Altitudes of top and base of hydrogeologic units--Continued.
[In feet above or below sea level]

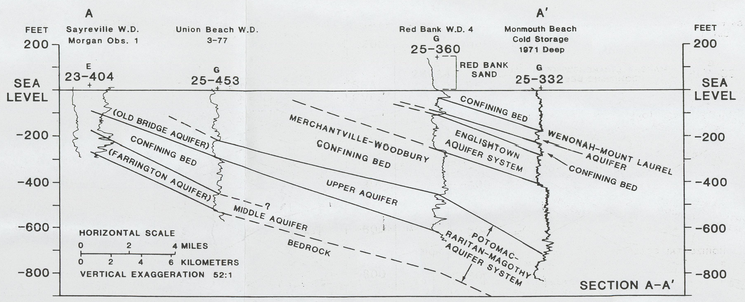
Well number	Altitude of land surface	Kirkwood-Cohansey aquifer system	Atlantic City 800-foot sand		Piney Point aquifer		Vincentown aquifer		Wenonah-Mount Laurel aquifer		Englishtown aquifer system		Potomac-Raritan-Magothy aquifer system					
													Upper aquifer		Middle aquifer		Lower aquifer	
		Base	Top	Base	Top	Base	Top	Base	Top	Base	Top	Base	Top	Base	Top	Base	Top	Base
25-374	20	--	--	--	--	--	--	--	--	--	-626	--	--	--	--	--	--	--
25-391	20	-16	--	--	--	--	--	--	-469	-541	-584	--	--	--	--	--	--	--
25-407	129	--	--	--	--	--	--	--	88	68	-17	-99	-281	-375	-457	-501	--	--
25-428	112	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
25-429	95	--	--	--	--	--	--	--	-351	-410	-471	--	--	--	--	--	--	--
25-436	60	--	--	--	--	--	--	--	-328	-398	-446	-632	-824	--	--	--	--	--
25-453	10	--	--	--	--	--	--	--	--	--	--	--	-218	-294	-452	-528	--	--
25-456	10	--	--	--	--	--	--	--	--	--	--	--	-204	-316	--	--	--	--
25-486	10	-110	--	--	--	--	--	--	-541	-602	-657	-857	--	--	--	--	--	--
25-487	130	20	--	--	--	--	-100	-140	-228	-298	-345	--	--	--	--	--	--	--
25-492	80	--	--	--	--	--	-52	-99	--	--	--	--	--	--	--	--	--	--
25-493	130	--	--	--	--	--	98	-40	-146	-257	-314	-422	-620	--	--	--	--	--
25-495	15	--	--	--	--	--	--	--	-117	-157	-235	-327	-543	-765	-867	-967	--	--
29- 9	5	-268	-554	-675	--	--	--	--	--	--	--	--	--	--	--	--	--	--
29- 19	10	-394	--	--	-518	-565	--	--	-1190	-1250	--	--	-1742	-1910	--	--	--	--
29- 25	41	--	--	--	--	--	--	--	-808	-863	-943	-1040	-1260	-1379	--	--	--	--
29- 45	8	-136	--	--	--	--	--	--	-496	-562	-614	-794	-1004	-1188	-1322	--	--	--
29- 70	5	--	--	-235	--	--	--	--	-798	-865	--	-1086	-1307	-1473	--	--	--	--
29- 85	65	-140	--	--	--	--	--	--	-589	-635	-717	-851	-1052	-1235	-1357	--	--	--
29-118	100	--	--	--	--	--	--	--	-296	-360	-420	-565	-742	-862	-950	--	--	--
29-134	95	20	--	--	--	--	--	--	-275	-361	-417	-560	-743	-871	-990	--	--	--
29-138	137	79	--	--	--	--	7	-43	-119	-209	-249	--	--	--	--	--	--	--
29-233	80	--	--	--	--	--	-82	-124	-210	-296	-350	--	--	--	--	--	--	--
29-238	133	--	--	--	--	--	--	87	-17	-74	-124	-223	-433	-511	-610	--	--	--
29-240	75	41	--	--	--	--	-45	-135	--	--	--	--	--	--	--	--	--	--
29-425	126	-106	--	--	-190	-261	--	--	--	--	--	--	--	--	--	--	--	--
29-429	65	-35	--	--	--	--	--	--	-433	-499	-559	-709	-905	--	--	--	--	--
29-433	50	-68	--	--	--	--	--	--	-497	-573	-618	--	--	--	--	--	--	--
29-440	72	-24	--	--	--	--	--	--	-358	-453	-505	-668	-904	-1052	-1166	--	--	--
29-441	30	--	--	--	--	--	--	--	-427	-506	-554	-722	--	--	--	--	--	--
29-449	55	--	--	--	--	--	--	--	-345	-435	-493	-655	--	--	--	--	--	--
29-453	10	--	--	--	--	--	--	--	-810	-880	--	-1115	-1334	-1500	--	--	--	--
29-457	8	-247	-530	-651	--	--	--	--	--	--	--	--	--	--	--	--	--	--
29-462	8	--	-453	-562	--	--	--	--	--	--	--	--	--	--	--	--	--	--
29-464	25	-150	-447	-523	--	--	--	--	--	--	--	--	--	--	--	--	--	--

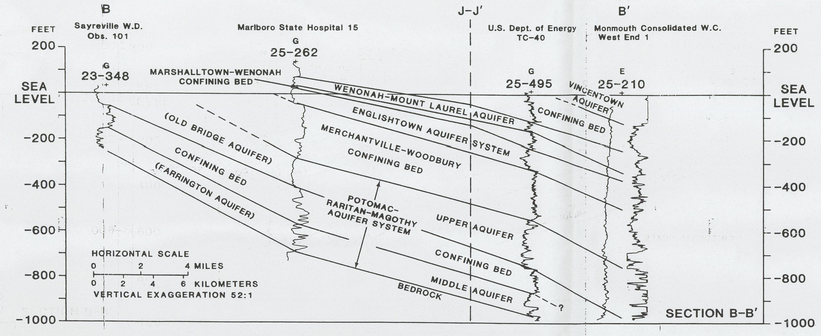
Reference 9 11/12

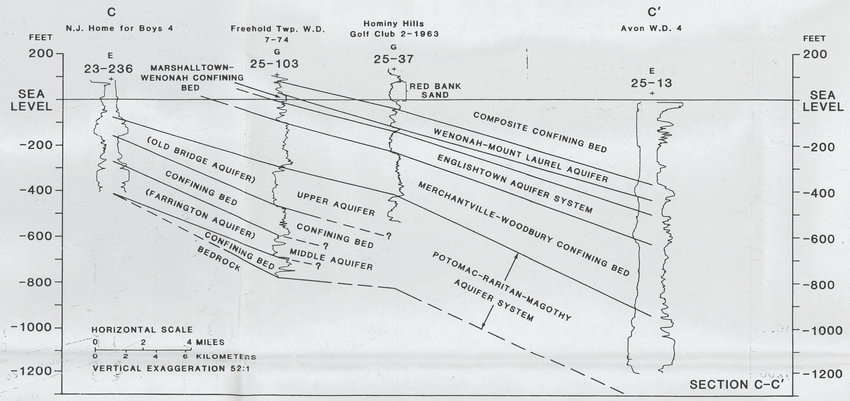
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

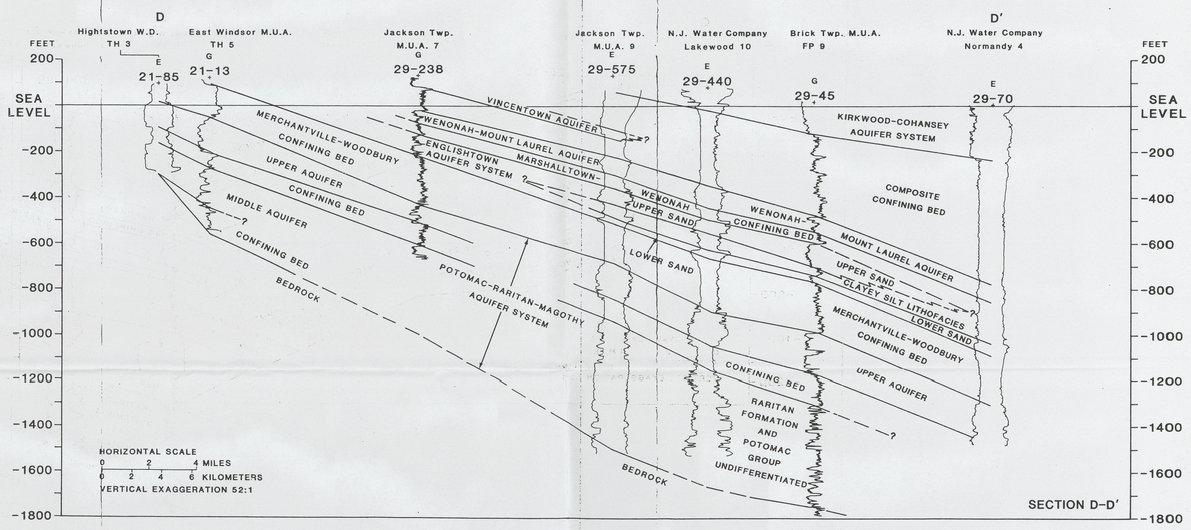
PLATE 3

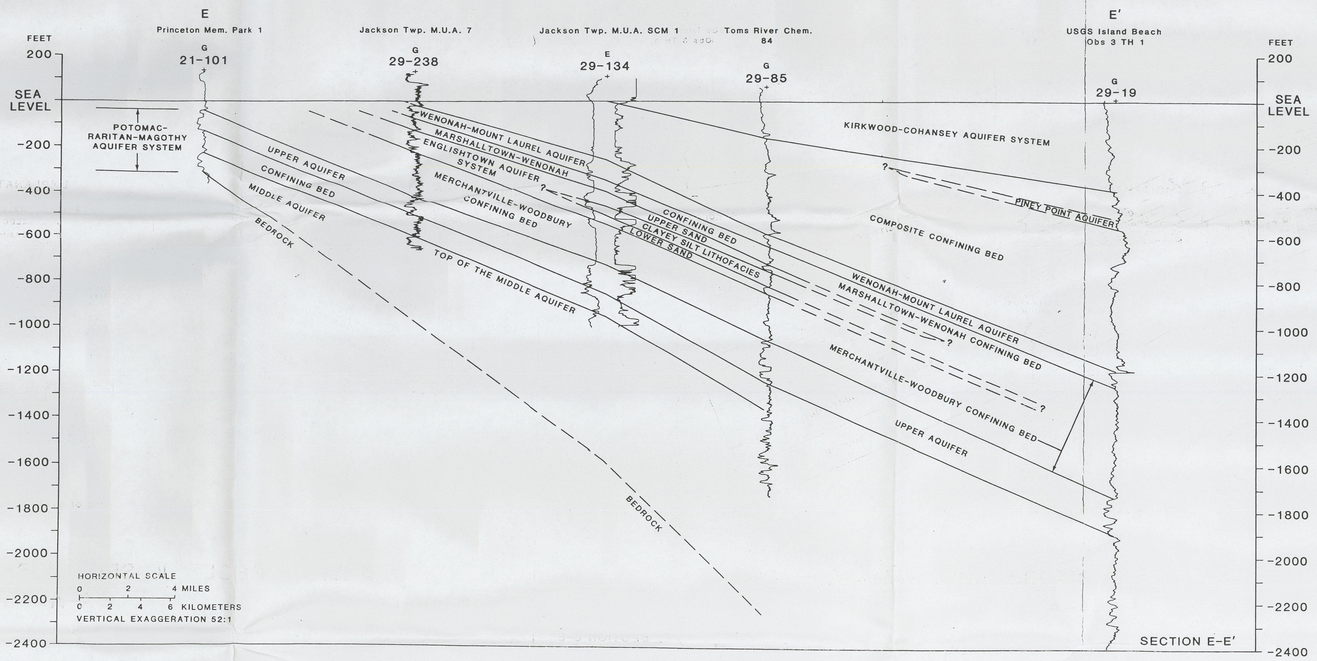
OPEN-FILE REPORT 84-730





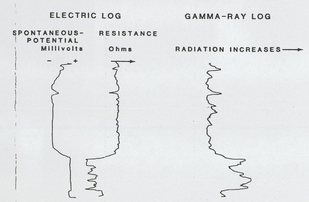






EXPLANATION

29-19 WELL NUMBER
E ELECTRIC LOG
G GAMMA-RAY LOG



LINE OF SECTIONS SHOWN ON PLATE 2

HYDROGEOLOGIC SECTIONS, COASTAL PLAIN, NEW JERSEY, A-A' through E-E'

REFERENCE NO. 10

FLOOD HAZARD BOUNDARY MAP H-01-02
FLOOD INSURANCE RATE MAP I-01-02

Reference 10 2/3 D-48

TOWNSHIP OF LAKEWOOD, NEW JERSEY

OCEAN COUNTY

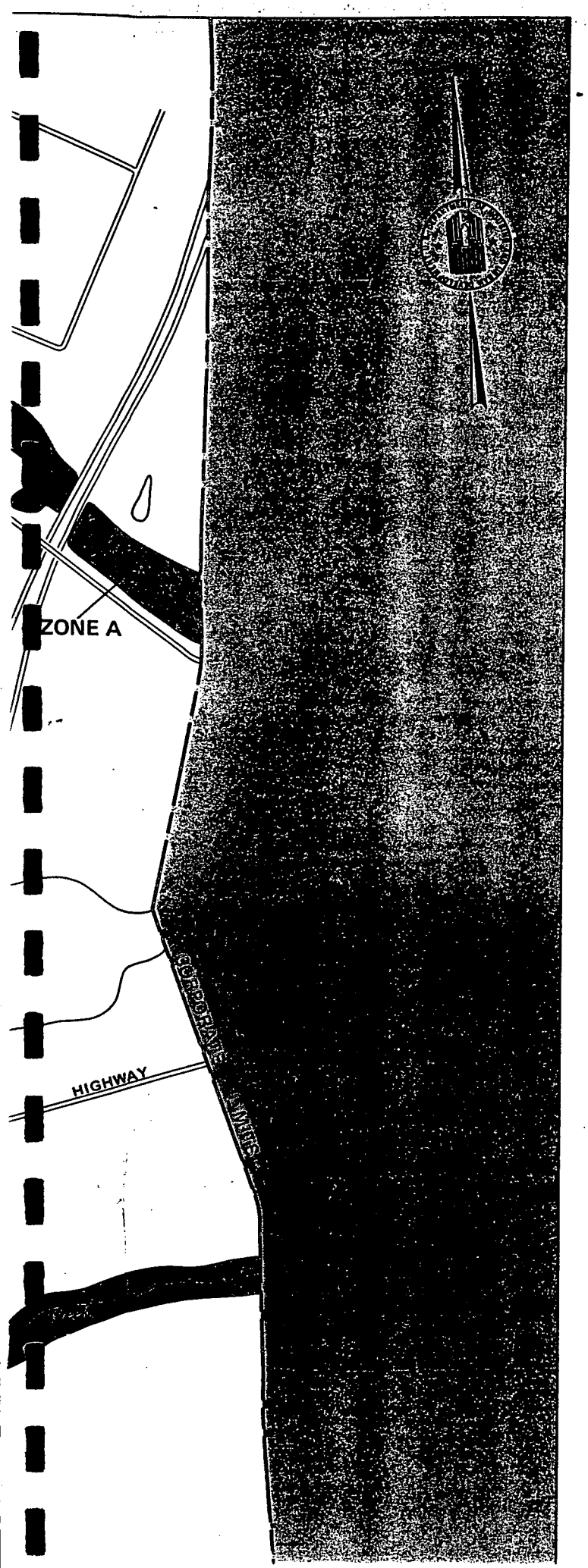
PANEL H&I-02

PAGE 2 OF 2 PRINTED

EFFECTIVE DATE:
MARCH 15, 1977

COMMUNITY NUMBER:
340378A

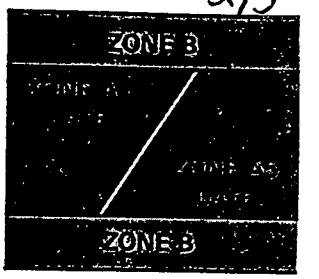
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION



KEY TO SYMBOLS

Reference 10
2/3

ZONE DESIGNATIONS* WITH DATE OF IDENTIFICATION
ie., 12/2/74



Base Flood Elevation Line with elevation in feet	513
Base Flood Elevation where uniform within zone	(EL. 987' MSL)
Elevation Reference Mark	RM7 ×
River Mile	• M1.5

*EXPLANATION OF ZONE DESIGNATIONS

A flood insurance map displays the zone designations for a community according to areas of designated flood hazards. The zone designations used by FIA are:

Zone	Explanation
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding; flood depth 1 to 3 feet; product of flood depth (feet) and velocity (feet per second) less than 15.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by a flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Area between limits of 100-year flood and 500-year flood; areas of 100-year shallow flooding where depths less than 1 foot.
C	Areas outside 500-year flood.
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V0	Areas of 100-year shallow flooding with velocity; flood depth 1 to 3 feet; product of depth (feet) and velocity (feet per second) more than 15.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

CONSULT NFIA SERVICING COMPANY OR LOCAL INSURANCE AGENT OR BROKER TO DETERMINE IF PROPERTIES IN THIS COMMUNITY ARE ELIGIBLE FOR FLOOD INSURANCE.

INITIAL IDENTIFICATION DATE: JANUARY 16,1974

CONVERSION TO REGULAR PROGRAM: MARCH 15,1977

APPROXIMATE SCALE IN FEET:

1000 0 1000

Reference 10 3/83

N

NEW JERSEY

CEDAR ST

HENRY STREET

PINE

ZONE A

OF

STREET

PROSPECT

AVENUE

SITE LOCATION

RAILROAD

ZONE C

CROSS

CENTRAL

THIS MAP IS FOR INSURANCE PURPOSES ONLY AND DOES NOT SHOW ALL PLANIMETRIC INFORMATION OUTSIDE OF SPECIAL FLOOD HAZARD AREAS.

MASSACHUSETTS

STREET

52

CHESTNUT

STREET

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, Secretary

WEATHER BUREAU
F. W. Reichelderfer, Chief

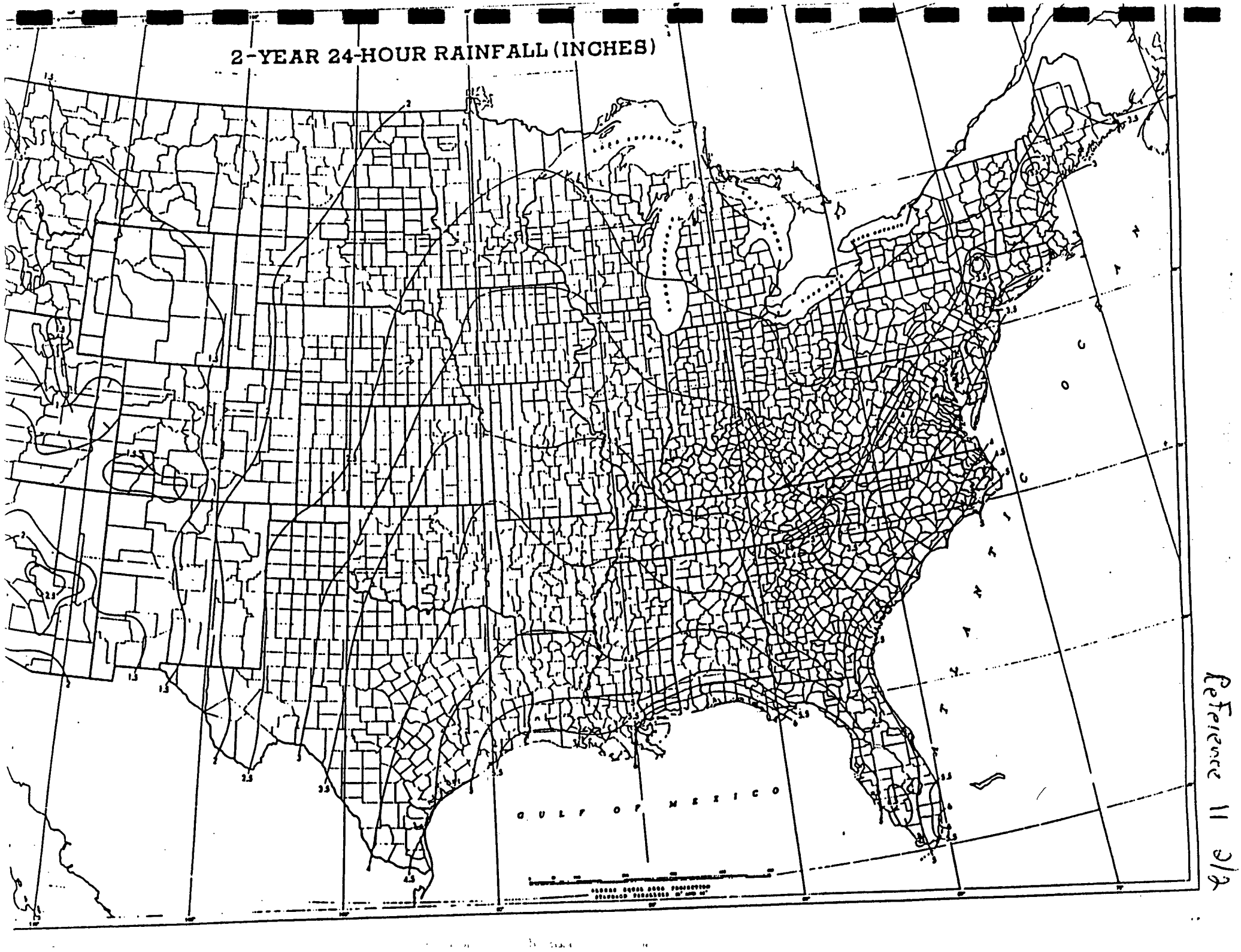
TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

Prepared by
DAVID M. HERSHFIELD
Cooperative Studies Section, Hydrologic Services Division
for
Engineering Division, Soil Conservation Service
U.S. Department of Agriculture

1963



Reference 11 3/2

REFERENCE NO. 12

Reference 12 1/11

Flow Calculation Sheet

There is a stream gauge (downstream of the PPE) located on the Toms River (2.6 miles north of the town of Toms River). The gauge is located at 39 59' 10" latitude and 74 13' 29" longitude.

The monthly averages from 1929 to 1967 were used to determine that the average yearly volumetric flow rate was 207.6 cubic feet/second.

The following is the calculation used to determine the yearly volumetric flow rate:

Statistics of monthly means, 1929-1967 for the Toms River.

October	153.7 cfs (cubic feet/second)
November	194.8 cfs
December	206.0 cfs
January	234.6 cfs
February	250.3 cfs
March	292.4 cfs
April	273.1 cfs
May	245.4 cfs
June	180.1 cfs
July	155.5 cfs
August	156.4 cfs
September	148.3 cfs

153.7 + 194.8 + 206.0 + 234.6 + 250.3 + 292.4 + 273.1 + 245.4 + 180.1 + 155.5 + 156.4 + 148.3 = 2,490.6

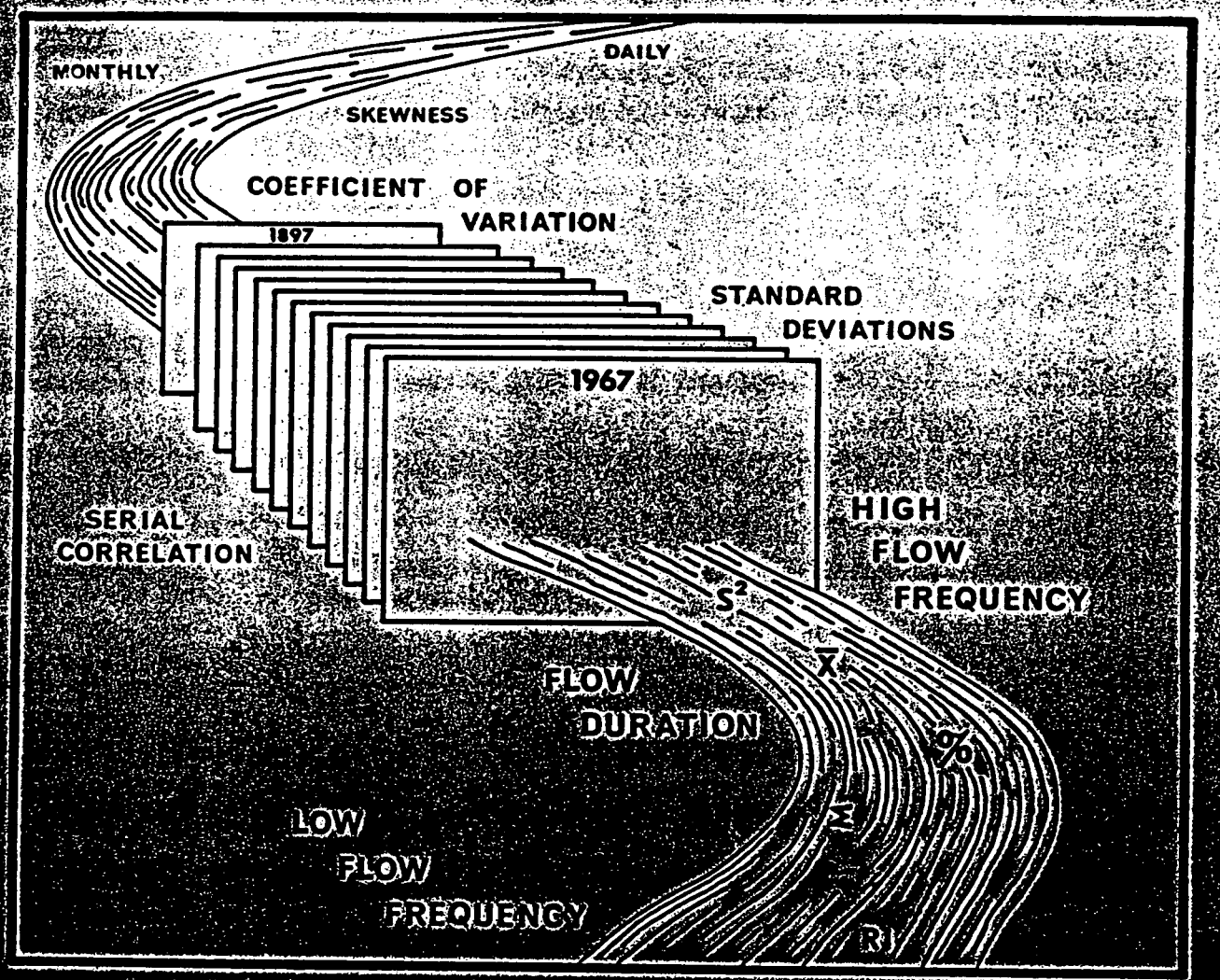
2,490.6/12 = 207.55 cfs

There are no stream gauges located along segment 4 of the target distance limit. The Flow rate for segment 4 of the target distance limit is estimated between 1,000 and 10,000 cubic feet per second due to its size compared to segment 3.

Reference 12 2/11

STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS

WATER RESOURCES CIRCULAR 23



STATE OF NEW JERSEY

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCES

Prepared in cooperation with
United States Department of the Interior
Geological Survey

1970

Reference 12 3/11

STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS

WATER RESOURCES CIRCULAR 23

By

Stanley L. Laskowski
Hydraulic Engineer
U.S. Geological Survey

Prepared by the U.S. Geological Survey
in cooperation with the
State of New Jersey
Department of Environmental Protection
Division of Water Policy and Supply

1970

Reference 12 4/11

STATE OF NEW JERSEY

Department of Environmental Protection

Richard J. Sullivan, Commissioner

Division of Water Policy and Supply

Robert L. Hardman, Acting Director

Water Policy and Supply Council

Lillian M. Schwartz, Chairwoman ..... Highland Park
J. Garfield De Marco..... Hammonton
I. Ralph Fox..... Rumson
Herman A. Klenner..... Rahway
Hermia Lechner..... Clinton
J. Duncan Pitney..... Mendham
Earl J. Reddert..... Madison
Paul J. Ritter..... Bridgeton
David I. Stepacoff..... Perth Amboy

Martha H. Brenna, Secretary

Reference 12 5/11

CONTENTS

Reference 12 6/11

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ILLUSTRATIONS

Reference 12 8/11

1-4080.00 MANASQUAN RIVER AT SQUANKUM, N. J.

STATISTICS OF MONTHLY MEANS, 1932-1967

	MEAN	STD DEV	SKEW	C OF VAR	PCT MEAN YR VOL	SER CORR
OCT	48.21	24.08	1.246	.4994	5.675	.304
NOV	67.82	30.48	.6183	.4495	7.984	.244
DEC	71.99	28.35	.7543	.3939	8.475	.430
JAN	84.59	32.85	.4641	.3884	9.958	.548
FEB	97.29	29.61	.2578	.3043	11.45	.426
MAR	110.4	30.49	.6608	.2762	13.00	.405
APR	93.99	30.09	.2929	.3202	11.07	.731
MAY	74.62	29.63	1.374	.3970	8.785	.511
JUN	50.89	24.56	1.841	.4827	5.991	.567
JUL	50.16	36.83	2.460	.7343	5.905	.545
AUG	48.24	27.03	.9377	.5603	5.679	.438
SEP	51.22	34.25	2.180	.6686	6.030	.314

STATISTICS OF LOGS OF MONTHLY MEANS, 1932-1967

	MEAN	STD DEV	SKEW	C OF VAR	PCT MEAN YR VOL	SER CORR
OCT	1.638	.1963	.4909	.1199	7.623	.400
NOV	1.787	.2036	-.2346	.1139	8.318	.393
DEC	1.824	.1771	-.3336	.0971	8.489	.538
JAN	1.894	.1751	-.2019	.0925	8.817	.617
FEB	1.967	.1420	-.5875	.0722	9.156	.374
MAR	2.027	.1178	.1056	.0581	9.438	.359
APR	1.950	.1457	-.3275	.0747	9.078	.704
MAY	1.844	.1549	.5924	.0840	8.585	.485
JUN	1.670	.1701	1.111	.1019	7.773	.590
JUL	1.622	.2482	.8040	.1530	7.550	.561
AUG	1.621	.2343	.2528	.1445	7.546	.497
SEP	1.639	.2413	.5317	.1473	7.627	.375

1-4085.00 TOMS RIVER NEAR TOMS RIVER, N. J.

Location.--Lat 39°59'10", long 74°13'29", 2.6 miles northwest of Toms River, N.J.

Drainage area.--124 sq mi.

Remarks.--Diversion since July 1966 significant at low flow only.

DURATION TABLE OF DAILY DISCHARGE

CLASS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34

YEAR	NUMBER OF DAYS IN CLASS	CFS_DAYS
1929	4 17 13 27 4 11 58 68 13 37 24 15 17 17 14 2 9 3 3 2 3 1 1	72238.0
1930	8 28 12 4 21 9 19 89 24 43 53 25 21 17 8 9 3 1 1	63364.0
1931	16 15 18 10 51 26 25 60 31 36 25 17 17 4 3 10 1	56235.0
1932	6 24 27 25 17 56 30 18 35 16 26 28 11 10 10 4 7 5 2 2 2 1 2 2	57001.0
1933	4 1 11 11 5 28 10 14 26 22 36 48 29 79 18 22 20 8 9 5 2 1 2 1 1	76742.0
1934	6 10 10 8 39 46 42 49 7 31 15 22 28 14 20 7 4 3 1 3	63599.0
1935	3 17 14 7 44 32 12 28 18 48 36 28 26 11 14 10 4 2 2 3 2 1 1	67093.0
1936	1 15 22 10 33 13 16 33 3 13 35 27 23 11 34 26 21 9 10 2 2 5 2	81517.0
1937	17 23 23 29 12 28 23 30 32 25 55 32 16 10 3 5 2	86408.0
1938	4 1 33 21 49 32 64 38 19 31 18 13 7 5 12 1 3 2 1 1 2 2 4 1 1	98851.0
1939	3 3 35 11 11 17 9 6 15 51 41 20 39 25 24 11 12 16 7 5 1 1 2	97890.0
1940	1 8 40 40 30 43 13 26 26 27 35 12 16 16 10 10 5 3 2 2 1	74583.0
1941	3 19 4 14 9 20 17 17 27 21 52 36 34 39 16 11 19 4 2 1	67911.0
1942	7 35 21 20 61 22 19 45 14 17 16 25 20 15 18 9 1	97356.0
1943	22 22 8 8 7 24 12 12 22 22 67 45 27 33 10 12 15 3 2 1 1	85076.0
1944	6 13 15 20 14 5 13 13 11 37 17 22 35 29 27 15 22 19 6 4 8 3 6 2 2 1 1	75529.0
1945	7 21 29 39 11 29 39 23 48 25 29 29 9 7 7 7 4 3 4 1	88518.0
1946	1 21 20 17 35 20 30 40 30 61 24 16 18 8 7 3 3 3 3 2 2 1	83097.0
1947	1 10 12 37 36 29 30 20 57 33 35 35 8 5 5 2 4 4 2	85512.0
1948	10 13 3 7 5 8 25 17 34 26 26 43 22 32 30 18 14 16 9 6 8 1	92496.0
1949	2 9 13 5 31 30 16 26 14 33 13 20 31 15 21 17 27 21 8 7 3 2 1	82817.0
1950	3 8 11 11 12 45 21 26 43 37 41 25 20 25 6 4 6 4	58480.0
1951	15 17 24 7 31 14 8 28 28 33 34 30 52 13 7 8 3 2 4 3 4	67588.0
1952	3 3 2 10 10 12 31 11 26 21 19 33 20 37 41 20 17 21 9 6 5 4 2 1 1 1	102935.0
1953	6 13 38 28 15 15 6 12 16 27 25 21 31 42 17 15 13 10 10 2 1 2	92476.0
1954	9 21 25 35 5 5 34 31 48 24 34 31 18 12 8 3 10 7 1 2 2	70477.0
1955	4 11 19 10 7 41 27 29 30 13 38 45 21 31 4 16 6 4 1 1 1 1 1	63386.0
1956	4 62 27 26 37 22 27 72 18 32 17 25 15 11 6 4 5 6	75085.0
1957	4 10 25 24 17 7 25 15 7 14 11 37 28 35 41 15 22 14 3 5 4 2	67241.0
1958	2 4 7 6 2 5 6 14 28 14 24 20 22 36 20 22 23 21 18 18 14 12 8 11 5 1 1 1	107947.0
1959	7 7 24 15 10 20 9 35 39 35 52 20 28 28 13 10 1 3 2 3 1 1 1 1	85151.0
1960	3 9 15 29 12 8 20 21 41 34 22 41 28 31 22 8 7 7 1 3 2 1 1	81768.0
1961	14 7 10 42 18 27 29 32 38 13 21 33 13 19 17 15 9 2 2 1 2 1	98247.0
1962	6 6 18 27 33 33 23 36 29 37 27 12 27 16 11 13 8 3 1 1 1 1	79063.0
1963	2 7 24 20 16 17 9 10 44 15 49 32 32 29 17 11 13 8 2 4 2	67220.0
1964	3 12 18 14 28 9 29 33 20 18 10 23 31 25 22 15 22 11 8 6 2 4 2 1	66044.0
1965	19 32 20 6 49 21 19 15 4 27 22 22 43 15 22 14 9 2 2 2	65334.0
1966	13 15 15 9 14 49 34 10 48 25 18 35 8 14 8 6 18 8 5 3 4 1 3 1 1	48741.0
1967	11 19 17 37 25 43 54 31 50 12 17 20 7 4 7 2 3 2 1 1 2	81782.0

CLASS	CFS	TOTAL	ACCUM	PERCT	CLASS	CFS	TOTAL	ACCUM	PERCT	CLASS	CFS	TOTAL	ACCUM	PERCT	CLASS	CFS	TOTAL	ACCUM	PERCT
0	0.00	0	14244	100.0	9	100.00	1143	12676	89.0	18	260.0	602	3336	23.4	27	630	42	100	.7
1	47.00	13	14244	100.0	10	120.00	745	11533	81.0	19	280.0	786	2734	19.2	28	700	18	58	.4
2	52.00	15	14231	99.9	11	130.00	663	10788	75.7	20	310.0	678	1948	13.7	29	770	17	40	.2
3	57.00	28	14216	99.8	12	140.00	1300	10125	71.1	21	350.0	348	1270	8.9	30	850	9	23	.1
4	63.00	92	14188	99.6	13	160.00	701	8425	62.0	22	380.0	279	922	6.5	31	940	3	14	.0
5	70.00	248	14096	99.0	14	170.00	1269	8124	57.0	23	420.0	217	643	4.5	32	1000	7	11	.0
6	77.00	430	13848	97.2	15	190.00	1169	6855	48.1	24	470.0	158	426	3.0	33	1100	3	4	.0
7	86.00	447	13418	94.2	16	210.00	1072	5686	39.9	25	520.0	101	268	1.9	34	1300	1	1	
8	95.00	295	12971	91.1	17	230.00	1278	4614	32.4	26	570.0	67	167	1.2					

Reference 12 9/11

LOWEST MEAN DISCHARGE, IN CFS, AND RANKING, FOR THE FOLLOWING NUMBER OF CONSECUTIVE DAYS IN YEAR BEGINNING APRIL 1

TOMS RIVER NEAR TOMS RIVER, N. J.

YEAR	1	3	7	14	30	60	90	120	183	ANNUAL
1929	84.0 24	84.0 24	88.3 25	88.6 21	99.0 23	105.0 20	116.0 19	129.0 18	148.0 17	196.0 18
1930	70.0 12	71.0 11	72.6 11	72.9 9	76.7 8	85.0 8	91.1 7	100.0 7	111.0 4	142.0 2
1931	75.0 17	75.7 16	78.4 16	80.6 14	86.9 13	98.0 14	101.0 10	104.0 8	120.0 6	162.0 5
1932	61.0 5	65.3 6	68.7 7	71.8 8	73.4 7	76.8 4	85.0 4	94.4 4	123.0 7	185.0 12
1933	77.0 20	78.0 20	85.6 22	88.9 22	95.3 19	108.0 22	130.0 23	157.0 27	160.0 24	189.0 14
1934	74.0 14	75.7 17	78.1 15	79.9 13	87.1 15	95.7 13	119.0 20	141.0 21	136.0 13	184.0 13
1935	75.0 18	75.3 14	79.9 18	82.4 15	86.9 14	99.0 15	117.0 17	130.0 19	150.0 18	218.0 24
1936	76.0 19	76.7 19	79.0 17	85.8 18	98.1 22	104.0 19	112.0 15	126.0 15	157.0 19	220.0 27
1937	100.0 32	107.0 33	111.0 33	120.0 34	130.0 34	154.0 36	172.0 36	175.0 35	207.0 36	234.0 32
1938	140.0 38	143.0 38	147.0 38	149.0 37	163.0 37	193.0 37	216.0 37	255.0 38	273.0 38	300.0 38
1939	94.0 28	95.0 28	97.6 29	105.0 28	111.0 26	129.0 27	141.0 27	150.0 26	158.0 22	204.0 19
1940	94.0 29	95.0 29	96.6 28	106.0 29	116.0 27	133.0 29	143.0 28	144.0 25	164.0 26	218.0 25
1941	69.0 10	69.3 9	70.1 8	70.2 7	72.9 6	79.2 6	86.6 6	93.9 3	110.0 3	160.0 3
1942	74.0 15	77.0 19	82.3 19	87.9 20	100.0 24	123.0 25	130.0 24	124.0 17	139.0 15	183.0 10
1943	64.0 6	65.3 7	67.0 6	66.5 4	69.7 3	73.9 2	85.2 5	108.0 9	131.0 10	183.0 11
1944	58.0 2	61.3 4	64.1 4	66.6 2	69.4 2	93.6 10	103.0 11	122.0 14	152.0 20	230.0 30
1945	108.0 34	109.0 34	113.0 34	124.0 36	133.0 35	142.0 33	144.0 29	162.0 30	183.0 32	241.0 31
1946	99.0 31	101.0 31	103.0 30	111.0 31	127.0 32	129.0 26	139.0 25	140.0 23	162.0 25	193.0 16
1947	93.0 23	83.0 23	83.4 20	84.6 17	90.2 16	94.4 11	106.0 12	118.0 13	159.0 23	209.0 29
1948	115.0 36	114.0 36	118.0 36	123.0 35	124.0 31	138.0 32	147.0 31	166.0 32	188.0 34	271.0 35
1949	74.0 16	75.3 15	77.0 14	82.7 16	101.0 25	113.0 23	120.0 21	127.0 16	133.0 11	176.0 6
1950	67.0 4	68.0 3	70.7 9	86.1 19	92.7 17	107.0 21	108.0 14	111.0 10	127.0 8	176.0 7
1951	73.0 11	71.3 12	72.6 10	76.7 10	77.9 11	95.4 12	100.0 9	111.0 11	138.0 14	224.0 28
1952	108.0 35	110.0 35	114.0 35	118.0 33	121.0 29	137.0 30	167.0 35	191.0 36	200.0 35	275.0 36
1953	85.0 25	85.3 25	87.7 23	92.6 24	96.7 20	99.1 16	125.0 22	195.0 22	166.0 27	217.0 23
1954	79.0 22	81.7 22	87.7 24	90.5 23	93.6 18	101.0 17	115.0 16	143.0 24	157.0 21	195.0 17
1955	64.0 7	64.0 5	66.4 5	70.0 6	77.6 9	103.0 18	118.0 18	139.0 29	146.0 16	180.0 8
1956	97.0 30	98.0 30	104.0 31	107.0 30	121.0 30	137.0 31	149.0 32	163.0 31	176.0 28	216.0 22
1957	56.0 3	59.3 2	62.6 2	64.6 5	72.1 5	76.8 3	81.3 3	89.9 2	102.0 2	211.0 21
1958	138.0 37	140.0 37	146.0 37	157.0 38	194.0 38	215.0 38	220.0 38	233.0 37	248.0 37	285.0 37
1959	90.0 27	92.0 27	92.7 27	94.1 25	97.8 21	116.0 24	139.0 26	156.0 29	182.0 31	274.0 29
1960	76.0 21	79.3 21	85.1 21	103.0 27	116.0 28	130.0 28	146.0 30	153.0 28	186.0 33	238.0 33
1961	104.0 33	104.0 32	111.0 32	117.0 32	140.0 36	153.0 35	166.0 34	172.0 34	176.0 29	250.0 34
1962	87.0 26	88.0 26	92.6 26	101.0 26	128.0 33	147.0 34	159.0 33	167.0 33	178.0 30	219.0 26
1963	62.0 9	71.0 10	74.9 13	79.6 12	86.3 12	87.8 9	92.6 8	95.7 5	112.0 5	162.0 4
1964	60.0 4	61.0 3	63.9 3	67.1 3	70.4 4	82.9 7	106.0 13	112.0 12	127.0 9	191.0 15
1965	72.0 13	72.7 13	74.7 12	77.1 11	77.7 10	78.0 5	79.9 2	81.6 1	88.4 1	136.0 1
1966	47.0 1	47.0 1	48.4 1	50.0 1	57.7 1	60.4 1	73.9 1	98.9 6	135.0 12	183.0 9
MEAN	82.632	84.039	87.255	92.179	100.739	112.974	125.042	136.695	155.274	207.158
VARIANCE	431.210	444.358	469.919	539.473	814.455	1058.741	1178.388	1398.499	1407.612	1386.729
STD DEV	20.766	21.080	21.678	23.227	28.539	32.538	34.328	37.396	37.518	37.239
SKEWNESS	1.047	1.064	1.044	.915	1.128	1.121	.930	1.183	1.032	.513
SE OF SKEW	.383	.383	.383	.383	.383	.383	.383	.383	.383	.383
SER CORR	.110	.124	.084	.111	.103	.129	.163	.149	.233	.316
C OF VAR	.251	.251	.248	.252	.283	.288	.275	.274	.242	.180
LOGS										
MEAN OF	1.905	1.912	1.929	1.952	1.988	2.037	2.082	2.121	2.179	2.310
VAR OF	.011	.011	.011	.011	.014	.014	.013	.013	.010	.006
STD DEV OF	.103	.103	.103	.105	.117	.118	.115	.112	.101	.078
SKEW OF	.375	.376	.340	.245	.294	.306	.230	.367	.188	-.007
SE OF SKEW OF	.383	.383	.383	.383	.383	.383	.383	.383	.383	.383
SER CORR OF	.124	.131	.093	.126	.142	.156	.170	.163	.235	.345
C OF VAR OF	.054	.054	.053	.054	.059	.058	.055	.053	.046	.034

DISCHARGE, IN CFS, FOR LOG-PEARSON TYPE III LOW-FLOW FREQUENCY CURVES FOR FOLLOWING NUMBER OF CONSECUTIVE DAYS

RECURRENCE INTERVAL (YEARS)	1	3	7	14	30	60	90	120	183	ANNUAL
100.00	49.302	50.227	51.993	53.243	55.158	61.394	68.334	77.882	90.899	134.490
20.00	55.759	56.781	58.948	61.170	63.963	71.256	79.636	89.045	104.454	151.985
10.00	59.846	60.928	63.322	66.100	69.540	77.524	86.720	96.157	112.785	162.210
5.00	65.520	66.685	69.363	72.848	77.288	86.258	96.478	106.087	124.077	175.505
2.00	79.131	80.493	83.732	88.655	95.910	107.352	119.579	130.150	150.081	204.004
1.25	97.605	99.226	103.009	109.410	121.255	136.259	150.347	163.276	183.413	237.064
1.11	109.865	111.657	115.686	122.825	138.110	155.592	170.452	185.517	204.539	256.395
1.04	125.481	127.485	131.716	139.555	159.606	180.355	195.735	214.099	230.492	278.727
1.02	137.242	139.404	143.713	151.926	175.811	199.095	214.561	235.795	249.424	294.163
1.01	149.138	151.458	155.787	164.256	192.212	218.120	233.427	257.875	268.100	308.766

Reference 12 10/11

1-4C85.00

HIGHEST MEAN DISCHARGE, IN CFS, AND RANKING, FOR THE FOLLOWING NUMBER OF CONSECUTIVE DAYS IN YEAR ENDING SEPTEMBER 30

TOMS RIVER NEAR TOMS RIVER, N. J.

YEAR	1	3	7	15	30	60	90	120	183	ANNUAL
1929	803.0 13	700.0 14	561.0 14	454.0 12	380.0 12	332.0 17	319.0 10	296.0 15	256.0 14	198.0 21
1930	429.0 36	393.0 35	330.0 36	287.0 37	281.0 31	247.0 35	231.0 35	219.0 35	207.0 35	174.0 33
1931	362.0 39	353.0 38	322.0 38	271.0 39	228.0 39	217.0 38	209.0 38	201.0 38	184.0 38	154.0 38
1932	663.0 22	618.0 21	491.0 21	371.0 24	352.0 19	290.0 23	259.0 29	233.0 33	213.0 33	156.0 37
1933	787.0 14	715.0 11	567.0 13	429.0 17	328.0 24	293.0 22	273.0 23	242.0 21	246.0 22	210.0 17
1934	486.0 31	453.0 33	375.0 33	312.0 33	279.0 34	264.0 29	262.0 26	240.0 28	218.0 32	174.0 34
1935	771.0 16	643.0 18	479.0 23	352.0 25	307.0 29	282.0 27	266.0 25	249.0 26	226.0 30	184.0 27
1936	632.0 21	620.0 20	530.0 16	445.0 14	372.0 13	343.0 17	334.0 9	320.0 9	294.0 10	229.0 14
1937	542.0 29	514.0 29	452.0 26	391.0 21	359.0 16	337.0 15	317.0 11	306.0 11	296.0 8	237.0 9
1938	1500.0 1	1230.0 1	870.0 1	615.0 2	487.0 3	405.0 6	366.0 7	337.0 7	289.0 11	271.0 3
1939	935.0 12	720.0 10	607.0 9	530.0 5	454.0 4	434.0 3	424.0 3	387.0 3	343.0 4	268.0 5
1940	644.0 23	580.0 25	468.0 25	415.0 19	354.0 17	342.0 15	315.0 13	307.0 13	257.0 17	204.0 20
1941	431.0 35	373.0 36	329.0 37	291.0 35	276.0 33	258.0 32	253.0 31	240.0 29	226.0 31	186.0 23
1942	371.0 38	329.0 39	298.0 39	289.0 36	281.0 32	255.0 33	236.0 34	220.0 34	192.0 37	157.0 36
1943	472.0 34	440.0 34	371.0 34	293.0 34	257.0 36	251.0 34	249.0 32	239.0 31	228.0 28	178.0 31
1944	1030.0 5	864.0 5	589.0 11	417.0 18	342.0 22	322.0 18	290.0 18	272.0 19	248.0 20	206.0 18
1945	712.0 19	652.0 17	481.0 12	500.0 8	449.0 5	362.0 9	317.0 17	316.0 10	295.0 9	243.0 8
1946	839.0 11	686.0 15	612.0 8	476.0 9	372.0 14	347.0 11	313.0 15	294.0 16	267.0 13	227.0 11
1947	479.0 33	464.0 31	422.0 30	338.0 27	319.0 27	260.0 31	246.0 33	234.0 32	226.0 29	179.0 30
1948	699.0 20	582.0 22	518.0 17	446.0 11	426.0 8	362.0 10	338.0 8	331.0 8	310.0 7	253.0 6
1949	763.0 17	656.0 16	516.0 18	442.0 15	404.0 9	386.0 7	374.0 6	356.0 6	314.0 6	227.0 12
1950	391.0 37	372.0 37	335.0 35	282.0 38	247.0 38	233.0 36	219.0 37	218.0 36	197.0 36	161.0 35
1951	566.0 27	558.0 27	510.0 19	394.0 20	320.0 26	296.0 21	274.0 22	260.0 22	243.0 23	185.0 24
1952	1130.0 3	980.0 2	716.0 3	509.0 6	447.0 7	411.0 5	398.0 4	374.0 4	364.0 2	281.0 2
1953	846.0 10	776.0 8	656.0 5	539.0 4	449.0 6	429.0 4	394.0 5	367.0 5	341.0 5	243.0 7
1954	639.0 24	581.0 23	441.0 28	351.0 26	345.0 20	283.0 26	261.0 27	240.0 30	212.0 27	194.0 22
1955	867.0 9	712.0 12	502.0 20	316.0 31	253.0 37	230.0 37	223.0 36	218.0 37	212.0 34	174.0 32
1956	620.0 26	580.0 24	483.0 22	384.0 23	369.0 15	333.0 16	312.0 17	284.0 17	255.0 18	205.0 19
1957	496.0 32	457.0 32	410.0 32	333.0 28	296.0 30	285.0 25	269.0 24	259.0 24	251.0 19	184.0 25
1958	1070.0 4	945.0 3	731.0 2	617.0 1	540.0 1	501.0 1	484.0 1	451.0 1	397.0 1	295.0 1
1959	913.0 7	830.0 4	657.0 4	598.0 7	489.0 11	372.0 19	288.0 19	274.0 18	247.0 14	233.0 10
1960	1270.0 2	932.0 4	639.0 7	429.0 16	344.0 21	339.0 14	313.0 16	304.0 12	272.0 12	223.0 13
1961	690.0 8	779.0 7	653.0 6	544.0 3	498.0 2	477.0 2	440.0 2	495.0 2	351.0 3	269.0 4
1962	925.0 6	775.0 9	604.0 10	470.0 10	404.0 10	368.0 8	314.0 14	301.0 14	265.0 15	217.0 16
1763	567.0 28	515.0 28	441.0 29	387.0 22	332.0 23	279.0 28	254.0 30	247.0 27	240.0 25	194.0 26
1964	621.0 25	573.0 26	451.0 27	328.0 29	324.0 25	261.0 30	259.0 28	260.0 23	236.0 26	180.0 28
1965	518.0 30	485.0 30	415.0 31	326.0 30	309.0 28	301.0 20	282.0 20	266.0 20	243.0 24	179.0 29
1966	723.0 18	638.0 19	469.0 24	315.0 32	270.0 35	205.0 39	194.0 39	195.0 39	169.0 39	134.0 39
1967	776.0 15	702.0 13	543.0 15	448.0 13	354.0 18	286.0 24	278.0 21	258.0 25	247.0 21	224.0 13

MEAN	719.743	635.256	511.385	406.872	353.667	318.667	298.641	283.000	259.513	207.282
VARIANCE	62729.629	37234.656	16065.844	8793.617	5593.777	4945.891	4291.586	3506.105	2642.138	1532.311
STD DEV	250.459	192.963	126.751	93.774	74.792	70.327	65.510	59.212	51.402	39.145
SKEWNESS	.967	.784	.501	.459	.540	.730	.961	.908	.769	.431
SE OF SKEW	.378	.378	.378	.378	.378	.378	.378	.378	.378	.378
SER CORR	.149	.202	.310	.317	.231	.257	.194	.231	.275	.334
C OF VAR	.348	.304	.248	.230	.211	.221	.219	.209	.198	.189
LOGS										
MEAN OF	2.833	2.784	2.696	2.598	2.539	2.493	2.466	2.443	2.406	2.309
VAR OF	.022	.017	.012	.010	.008	.009	.008	.008	.007	.007
STD DEV OF	.147	.131	.108	.099	.091	.093	.091	.087	.083	.081
SKEW OF	.063	-.072	-.136	.090	.097	.247	.440	.465	.281	.063
SE OF SKEW OF	.378	.378	.378	.378	.378	.378	.378	.378	.378	.378
SER CORR OF	.194	.253	.336	.326	.239	.269	.220	.268	.302	.339
C OF VAR OF	.052	.047	.040	.038	.036	.037	.037	.035	.035	.035

DISCHARGE, IN CFS, FOR LOG-PEARSON TYPE III HIGH-FLOW FREQUENCY CURVES FOR FOLLOWING NUMBER OF CONSECUTIVE DAYS

RECURRENCE INTERVAL (YEARS)	1	3	7	15	30	60	90	120	183	ANNUAL
1.01	313.920	296.274	270.734	236.538	216.151	196.746	192.463	186.813	169.657	132.883
1.05	391.814	367.592	325.965	273.891	246.967	222.401	213.148	205.527	188.811	150.195
1.11	441.537	411.810	359.081	296.536	265.484	238.167	226.234	217.382	200.526	160.444
1.25	510.899	471.921	402.893	326.866	290.115	259.536	244.379	233.828	216.344	173.916
2.00	677.977	610.047	499.058	395.252	345.028	308.766	287.757	273.155	252.536	203.352
5.00	904.214	784.601	613.264	480.265	412.292	371.954	346.255	326.159	298.558	238.432
10.00	1053.221	893.097	680.866	532.789	453.392	412.067	384.852	361.101	327.556	259.407
25.00	1241.178	1023.824	759.400	596.028	502.477	461.423	433.775	405.347	363.040	284.055
50.00	1381.244	1117.357	813.845	641.343	537.408	497.488	470.464	438.500	388.845	301.351
100.00	1521.561	1208.103	865.408	685.417	571.208	533.113	507.449	471.896	414.241	317.908

Reference 12 11/11

1-4085.00 TOMS RIVER NEAR TOMS RIVER, N. J.

STATISTICS OF MONTHLY MEANS, 1929-1967

	MEAN	STD DEV	SKEW	C OF VAR	PCT MEAN YR VOL	SER CORR
OCT	153.7	53.53	1.175	.3483	6.170	
NOV	194.8	57.11	.2968	.2932	7.821	.507
DEC	206.0	63.94	.7093	.3104	8.272	.392
JAN	234.6	65.82	.5008	.2805	9.420	.394
FEB	250.3	60.36	.8377	.2412	10.05	.581
MAR	292.4	76.98	1.285	.2633	11.74	.507
APR	273.1	72.34	.6295	.2649	10.97	.543
MAY	245.4	72.83	1.095	.2967	9.854	.792
JUN	180.1	54.49	1.174	.3025	7.233	.577
JUL	155.5	68.98	2.184	.4437	6.242	.648
AUG	156.4	70.32	.8038	.4496	6.280	.433
SEP	148.3	63.12	1.054	.4256	5.954	.482
						.385

STATISTICS OF LOGS OF MONTHLY MEANS, 1929-1967

	MEAN	STD DEV	SKEW	C OF VAR	PCT MEAN YR VOL	SER CORR
OCT	2.163	.1417	.3394	.0655	7.895	
NOV	2.271	.1326	-.3468	.0584	8.286	.548
DEC	2.294	.1353	-.1331	.0590	8.371	.403
JAN	2.354	.1233	-.1648	.0524	8.589	.500
FEB	2.386	.1037	-.1082	.0435	8.709	.665
MAR	2.453	.1055	.6051	.0430	8.952	.475
APR	2.422	.1136	.0643	.0469	8.838	.536
MAY	2.373	.1204	.4739	.0508	8.660	.752
JUN	2.238	.1208	.6041	.0540	8.169	.521
JUL	2.160	.1606	.8299	.0744	7.882	.631
AUG	2.153	.1914	.1494	.8890	7.857	.447
SEP	2.135	.1785	.1413	.0836	7.792	.520
						.418

1-4090.00 CEDAR CREEK AT LANOKA HARBOR, N. J.

Location.--Lat 39°52'05", long 74°10'06", 20 ft upstream from bridge on U.S. Highway 9.

Drainage area.--56.0 sq mi.

Remarks.--Occasional regulation by cranberry bogs significant but erratic.

DURATION TABLE OF DAILY DISCHARGE

CLASS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	
YEAR																																				
1933																																				
1934						1		2			2	3	9	10	22	38	43	43	56	29	17	31	20	21	5	3	4	4		1	1					
1935					2					1		3	8	10	41	58	72	44	31	28	16	15	11	1	1	1										
						1	2	2	5	1	3	1	24	30	46	22	39	73	31	10	29	8	9	3	2		3	1									
1936																																				
1937						2	2	4	2			3	2	30	17	44	33	38	53	13	24	25	21	33	3	7	5		1							
1938								1	2	1			2	10	16	42	27	41	49	23	28	51	22	20	4	3	1								
1939										3	2	1	1	9	16	27	40	64	37	44	33	29	20	10	8	4	3								
1940														3	10	8	30	39	40	35	39	42	48	31	26	7	4								
								1	1	2	1		4		9	42	67	74	32	17	34	20	26	6	6	1	3			1	1	1		2		
1941																																				
1942						2			2	1	4	1	10	17	33	48	46	76	40	24	29	24	8												
1943				3	3			2	1	2	5	7	16	30	65	63	45	33	32	18	9	5	5		1										
1944			1	1	1	1					1	4	4	25	32	63	45	48	40	31	26	11	8	1											
1945				1	1			1	2	1	1	7	19	15	27	27	39	42	44	23	26	33	25	10	9	7	2			1			2	1	
			4	1			1	2			4		4	2	47	46	32	68	15	29	48	31	14	5	8	4									
1946		1	4	1		1																													
1947		1	3						1	1	4	4	10	11	31	35	46	50	38	36	41	22	10	6		4	4	2							
1948			3				1	1	3	1	6	9	24	33	56	57	65	54	17	10	18	2	2	2		1									
1949						1	1	2	1	2	6	4	7	3	6	9	43	54	41	37	47	38	28	10	9	4	4	3	1								
1950							1			1	3	2	8	9	32	41	32	37	14	14	27	35	48	9	11	1										
		1	3	1	2		1	3	2	1	7	14	25	38	63	51	60	34	13	8	8	9			1										
1951		1																																	
1952				2	1	1		2	5	3	17	17	50	30	43	51	49	38	21	7	10	5	10	1	1										
1953				2	1	1	3	2	2	1	3	5	6	3	7	30	44	34	42	20	45	41	31	14	12	10	2	2	3							
1954						1				1	1	3	7	3	19	32	32	36	39	20	64	39	33	18	10	2	3	2							
1955					3	4			2	2	3	3	17	28	39	32	62	65	28	18	19	14	11	3	6	3	1								
				1	1	4		5	3		6	14	32	45	44	31	41	53	18	16	25	5	8	3	2	2	1	1							
1956		1	2	1	1	4	3	2	2	1	4	11	20	41	48	60	46	30	20	15	22	11	8	4	5	1	3								
1957		2	1			4	3	1	4	9	43	31	26	10	41	48	50	28	18	20	15	6	2	1	1		1								
1958		1				2	3	3	2	2	3	11	8	9	16	20	9	10	17	13	30	34	48	18	32	12	14	10	12	5		1				

YEAR	CFS_DAYS
1933	39541.0
1934	34998.0
1935	34356.0
1936	38887.0
1937	38795.0
1938	48425.0
1939	55422.0
1940	41389.0
1941	36188.0
1942	30101.3
1943	35407.7
1944	45051.0
1945	40937.2
1946	39979.5
1947	30933.2
1948	44619.3
1949	44019.0
1950	29558.2
1951	28998.2
1952	47432.4
1953	47285.0
1954	35431.0
1955	37399.0
1956	33941.0
1957	28154.0
1958	41591.0

CLASS	CFS	TOTAL	ACCUM	PERCT	CLASS	CFS	TOTAL	ACCUM	PERCT	CLASS	CFS	TOTAL	ACCUM	PERCT	CLASS	CFS	TOTAL	ACCUM	PERCT
0	0.00	0	9496	100.0	9	35.00	39	9307	98.0	18	110.0	733	3446	36.6	27	320	28	67	.7
1	13.00	8	9496	100.0	10	39.00	133	9268	97.6	19	120.0	568	2933	30.9	28	360	19	39	.4
2	15.00	21	9488	99.9	11	45.00	165	9135	96.2	20	130.0	771	2365	24.9	29	410	10	20	.2
3	17.00	13	9467	99.7	12	50.00	380	8970	94.5	21	150.0	562	1594	16.8	30	460	1	10	.1
4	19.00	11	9454	99.6	13	57.00	479	8590	90.5	22	170.0	507	1032	10.9	31	520	2	9	.0
5	21.00	29	9443	99.4	14	64.00	999	8111	85.4	23	200.0	168	525	5.5	32	590	1	7	.0
6	24.00	29	9414	99.1	15	73.00	1024	7112	74.9	24	220.0	164	357	3.8	33	670	5	6	.0
7	27.00	36	9385	98.8	16	82.00	1156	6088	64.1	25	250.0	74	193	2.0	34	760	1	1	.0
8	31.00	42	9349	98.5	17	93.00	1246	4932	51.9	26	280.0	52	119	1.3					

REFERENCE NO. 13

Reference 13 1/20

FRENCH & PARRELLO ASSOCIATES, P.A.
CONSULTING ENGINEERS
Since 1974

670 NORTH BEERS STREET BLDG. #3
HOLMDEL, NEW JERSEY 07733
(908) 888-7700

TERRY O. BLACKBURN, P.E. PHD
JOSEPH M. EDWARDS, P.E.
LAURENCE E. FRENCH, P.E.
JAMES B. HELLER, P.E.
ARGO T. PARRELLO, P.E.
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PETER M. LONGO, P.E.
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MARK E. ZELINA, P.E., P.P., C.M.E.

REPORT OF GEOTECHNICAL ENGINEERING EVALUATION AND PHASE II DESIGN FOR THE PROPOSED CLOSURE OF THE CROSS STREET LANDFILL LAKEWOOD TOWNSHIP, NEW JERSEY

Submitted to:

MC SWEENY & DREWES
1466 Route 88 West
Bricktown, NJ 08723

Submitted by:

FRENCH & PARRELLO ASSOCIATES, P.A.

92G111AR1

May 24, 1994

Reference 13 2/20

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May 24, 1994

McSweeny & Drewes
1466 Route 88 West
Bricktown, NJ 08723

Attn: Mr. Dave Magno

Re: Report of Geotechnical Engineering Evaluation and Phase II Design for the Proposed Closure of the Cross Street Landfill
Lakewood Township, Ocean County, NJ
FPA No. 92G111AR1

Dear Mr. Magno:

We are pleased to present our Report of Geotechnical Engineering Evaluation and Phase II Design for the Proposed Closure of the Cross Street Landfill. Our scope of services have been performed in accordance with our proposal dated May 7, 1993, and with your authorization.

We thank you for the opportunity to be of service to you on this project. Should you have any questions or comments concerning our project involvement, please do not hesitate to contact us.

Very truly yours,

FRENCH & PARRELLO ASSOCIATES, P.A.

Steven A. Tardy

Raafat R. Mankbadi, P.E.
Project Manager

Scott W. Watkins, P.E.
Principal
NJ P.E. Lic. No. 29173

SAT/RRM/sb

Reference 13 3/20

FPA

REPORT OF GEOTECHNICAL ENGINEERING EVALUATION AND PHASE II DESIGN FOR THE PROPOSED CLOSURE OF THE CROSS STREET LANDFILL LAKEWOOD TOWNSHIP, NEW JERSEY

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ABSTRACT

Lakewood Township, New Jersey, is currently pursuing steps to close the existing Cross Street Landfill. The work is being performed in accordance with the requirements of the New Jersey Administrative Code (NJAC), Title 7, Chapter 26, Section 2A.9, The Closure and Post-Closure Care of Sanitary Landfills. The landfill, which typically accepted municipal wates, consists of two waste cells each of which are approximately 14 acres in plan area. The landfill became operational prior to the implementation of the current landfill regulations and, consequently, has no bottom liner or leachate collection system. Closure of the landfill will require the construction of a final cap, gas venting system, and drainage structures. The primary intent of the proposed construction is to minimize the source of leachate fluid and thereby mitigate the potential for groundwater contamination. Cross Street Landfill is not federally owned and is, therefore, not subject to Subtitle D regulations.

French and Parrello Associates, P.A. has performed site reconnaissance and analyses, and has developed geotechnical engineering recommendations regarding the construction of a final cap and gas venting system. The suitability of the two final cap alternatives, clay and geosynthetic, were evaluated. Based upon our evaluation, it is our opinion that the construction of a two-foot thick cap incorporating a 40 mil HDPE membrane would be most appropriate for this project. In accordance with NJDEPE regulations, the proposed final cap side slopes have been limited to a maximum of 3 horizontal to 1 vertical. Our analyses indicate that the landfill will have adequate stability with regard to global (rotational) slope failure and sliding along the HDPE membrane interface, provided a textured HDPE membrane is utilized on slopes steeper than 6 horizontal to 1 vertical. Smooth HDPE may be utilized on the remaining sections of the cap.

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In conjunction with our site reconnaissance, a soil gas survey was performed. The results on the survey indicate that moderate amounts of combustible gases are being generated by the decomposition of the waste fill. To allow for the disipation of these gases from beneath the HDPE membrane, the construction of a passive gas venting system will be required. The venting of gases will serve to protect the cap membrane against damage and will aid in mitigating the flow of gases into adjacent properties. NJDEPE regulations require that no greater than 25 percent of the lower explosive limit of any combustible gas be emitted at the property line. In the event that post construction air monitoring indicates greater amounts of gas emissions or the presence of non-methane hydrocarbon (NMHC), the venting system may need to be modified to an active system.

NJDEPE regulations require that the landfill be maintained for a period of 30 years following closure, Post Closure Care. A schedule of upkeep and anticipated maintenance has been established for the project and will include periodic inspections, mowing of vegetation, settlement and air monitoring, as well as the repair of torn liner, monitoring wells, gas venting system components, and cap erosion. A financial plan which directly reflects the costs associated with constructing the final cap and gas venting system and performing scheduled up-keep and anticipated maintenance has been prepared. The cost of modifying the proposed passive gas venting system to an active system or additional analyses and testing, if required by the NJDEPE, was not incorporated into the financial plan.

FPA

1.0 INTRODUCTION

1.1 Authorization

French and Parrello Associates, P.A. (FPA) has performed site reconnaissance and analyses, and has developed geotechnical engineering recommendations regarding the construction of a final cap and gas venting system for the Cross Street Landfill, Lakewood Township, New Jersey. Construction drawings, specifications and financial plans for the closure and post-closure care of the landfill are being prepared by McSweeney & Drewes, Inc., the Prime Consultant. Our current scope of services were performed for McSweeney & Drewes in accordance with our proposal dated May 7, 1993. Authorization for these studies was provided by McSweeney & Drewes, Inc.

1.2 Project Description

The Township of Lakewood is currently pursuing steps to close the existing Cross Street Landfill. The work is being performed in accordance with the requirements of the New Jersey Administrative Code (N.J.A.C.) Title 7, Chapter 26, Section 2A.9, The Closure and Post-Closure Care of Sanitary Landfills. Closure requirements will include the construction of a final cap, gas venting system, and drainage structures. Maintenance of these systems and monitoring of settlements and groundwater quality are addressed under post-closure care requirements. The construction of the improvements have been incorporated into Phase II of the project. Phase I of construction was completed in 1992 and included the regrading of the landfill, placement of a landfill cover and the construction of drainage basins and swales.

The Cross Street Landfill consists of two waste cells each of which are approximately 14 acres in plan area. The landfill was operational between 1973 and 1982. The landfill typically accepted

solid municipal wastes, bulky clean-up wastes, as well as liquid types, such as sewage sludge and non-hazardous chemical wastes. The landfill became operational prior to the implementation of the current landfill regulations and, consequently, has no bottom liner or leachate collection system. The primary intent of the proposed construction is to minimize the source of leachate fluid and thereby mitigate the potential for groundwater contamination. Cross Street Landfill is not federally owned and is, therefore, not subject to Subtitle D regulations.

1.3 Purpose

The purpose of our work was to: 1) evaluate the most appropriate final cap and gas venting system alternatives; 2) evaluate the stability of the proposed landfill configurations and the potential for geotechnical concerns; 3) prepare details and specifications for the cap and gas venting system to be incorporated into the project plans and specifications; 4) evaluate cost and material quantities for the cap and gas venting system, and 5) evaluate post-closure care requirements and associated costs for the cap and gas venting systems.

1.4 Scope of Work

Our scope of work to accomplish the stated purpose was performed in accordance with our proposal dated May 7, 1993, and included:

1. Evaluation of subsurface conditions by:

    a. Interpreting test borings performed during previous site explorations.

b. Reviewing published geologic data.
c. Reviewing published literature regarding strength properties of municipal wastes.

2. Evaluation of landfill cap alternatives by:

a. Evaluating advantages and disadvantages, including cost of each of the two main cap alternatives, clay and geosynthetics.
b. Reviewing current practices among other New Jersey landfills with regard to final cover.
c. Evaluating the effectiveness and required thickness of each cap component (topsoil, sand, clay, geosynthetic).
d. Performing slope stability analyses to evaluate the global stability of the proposed landfill configuration.
e. Evaluating side slope frictional stability between cap components.
f. Evaluating the effects of long term landfill deformations on cap integrity.

3. Evaluation and design of an appropriate gas venting system by:

a. Developing and implementing a field exploration program to collect data on the current levels of landfill gas production.
b. Evaluating field data to assess the overall size of the venting system.

4. Preparation of cap and gas venting system details and specifications including:

   a. Typical final cover section detail, a cover perimeter detail, and other specific details where structures will protrude through the cover.
   b. Typical gas venting system details, as well as specific cap/vent interface details.
   c. Preparation of technical specifications regarding the landfill cap and gas venting system as well as earthwork operations (to be forwarded under separate cover).

5. Evaluation of material quantities and costs for the landfill cap and gas venting systems.

6. Evaluation of post closure care requirements and costs for the final cap and gas venting system as required to complete schedules "A" and "B" of the NJDEPE Sanitary Landfill Closure Financial Plan.

7. Preparation of this report.

2.0 SITE DESCRIPTION

2.1 Site Location & Access

Cross Street Landfill is located in Lakewood Township, Ocean County, New Jersey. It is situated in the southwest corner of Lakewood on the Lakewood Township, Jackson Township, and Dover

Township border. The landfill is bordered to the north by Cross Street, to the east by Massachusetts Avenue, to the south by Whitesville Avenue, and to the west by Faraday Avenue and a branch of the Central Railroad of New Jersey. The landfill is located approximately 3000 feet south of Cross Street. The site location is presented on Drawing No. 1, "Regional Location Plan".

A paved access roadway extends from the northern end of the site to Cross Street. It bisects an undeveloped lot to the north and daylights at the intersection of Cross Street and the Central Railroad of New Jersey line. The undeveloped lots are owned by Stavola, Inc. It is not known whether an easement has been obtained for the roadway. The roadway has undergone significant deterioration including cracking and rutting.

2.2 Previous Studies

Based upon available information, it is our understanding that no formal engineering evaluation was performed prior to the opening of the landfill. In 1981, an evaluation was performed to determine the potential for expanding and upgrading the landfill. Issues addressed included waste flows, subsurface conditions, hydrological features, liners and leachate collection systems, and environmental impacts. The results of the evaluation are presented in a report entitled, "Feasibility Assessment of Northern Regional Sanitary Landfill Site", prepared by Elson T. Killam Associates, Inc. and dated October 1981. The project was never implemented.

2.3 Landfill History: Operations & Waste Fill Data

The Cross Street Landfill accepted waste fill from 1973 through 1982. Detailed information regarding the landfill

operations is limited. Prior to the commencement of the landfill operations, the land was utilized as a sand and gravel borrow area. Lots adjacent to this site have also been utilized for mining purposes. Waste fills accepted at the site included municipal wastes (residential, commercial, and institutional), bulky wastes, construction and demolition debris, dry/liquid sewage sludge, and non-hazardous chemical waste liquids. Available data regarding historical waste flow into the landfill is presented in Table 1.

2.4 Site and Subsurface Conditions

2.4.1 Topography

The site topography is variable and is characterized by several man-made features. Visual observations indicate that the areas surrounding the site to the north, south and west are relatively flat to gently rolling. Within the site limits, the two waste cells and drainage basins provide an approximate 45 foot relief in topography. The side slopes of the cells and basins vary. Revised topographic data, by McSweeney and Drewes - August 1993, indicate maximum side slopes of 3 horizontal to 1 vertical with the majority being flatter than 4 horizontal to 1 vertical. The topography east of the site is variable as a result of previous sand and gravel mining operations. Slopes of approximately 2 horizontal to 1 vertical were observed along the eastern and western borders of the property, outside of the landfill area.

2.4.2. Subsurface Conditions

To evaluate the subsurface soil conditions, French and Parrello Associates has reviewed the following sources of data:

1. Ten test borings performed by Elson T. Killam Associates, Inc. The logs are presented in a report entitled "Feasibility Assessment of Northern Regional Sanitary Landfill Site", and dated October 1981. The borings, designated PN-1 through PN-9 and NCB-1, were advanced utilizing unspecified methods to depths ranging from 20 to 60 feet. Standard Penetration Testing (SPT) was performed. The boring logs are presented in Appendix A.

2. Seven soil logs generated by W.C. Services, Inc. in March 1986, during the installation of monitoring wells. The wells, designated MW-1 through MW-7, were advanced using hollow stem auger drilling procedures to depths ranging from 18 to 56 feet. The well logs are presented in Appendix B.

3. Published geologic maps and reports, and geotechnical data obtained by FPA on other projects performed in the vicinity of the Cross Street Landfill.

Natural Formations

Our review of the subsurface data indicates that the soil deposits underlying the waste fills are consistent across the site. In general, the soils consist of medium dense to dense, course to fine sand intermixed with varying fractions of coarse to fine gravel and trace amounts of silt. An approximately 1.0 to 2.0 foot thick layer of stiff to hard clay is interbedded within these deposits. Published geologic data indicates that the deposits are both alluvial and marine in origin.

Waste Fill

Our review of the subsurface data indicates that the information available on the composition and depth of the waste fill is limited. A single test boring, designated NCB-1, was advanced through the waste fill. The waste fill extended to approximately EL. +66.0 feet and consisted of wood, brick, steel, paper, cinder and glass. Based on the existing elevation of the landfill at the boring location, Elevation +120.0 Ft., the waste fill is approximately 54 feet thick. No topographic information from before the commencement of landfill operations was available. Historical waste flow data is presented in Section 2.3 and Table 1.

Groundwater

Well readings obtained during site reconnaissance indicate that the groundwater surface elevation varies from approximate +67.7 to +73.3 feet. Seasonal fluctuations should be anticipated. For analytical purposes, the piezometric surface will be assumed to be at elevation +72.0 feet.

2.5 Seismicity

Ocean County, New Jersey lies within a potentially active seismic region and is designated as a Zone I Seismic hazard by the BOCA National Building Code. Based upon recent published information, the peak horizontal acceleration (on rock) at the landfill site is 0.08(g). To adjust for local soil conditions, a review of the subsurface data and the National Building Code indicates that a site amplification factor of 2.0 would be appropriate for zones within the waste fill. Therefore, to account

The gas sampling was performed across the site on a 200 x 200 foot grid. The test method included advancing an approximate 3/4 inch diameter steel rod 1 1/2 feet into the regraded landfill cover. Upon the removal of the rod, an approximately 4 foot long, 5/32 inch inside diameter aluminum sampling tube (capped at the upper end) was inserted into the hole. The hole was sealed at the ground surface. Following a minimum 30 minute waiting period, the gases within the tubes were sampled utilizing an Aim Model 3200 gas detector and an HNu Model P-101 photo ionization meter. The sampling locations are presented on Drawing No. 2. "Soil Gas Survey Location Plan". The results of the gas survey are presented in Table 2.

4.0 PHASE I CONSTRUCTION

Phase I of the closure of the Cross Street Landfill was performed from approximately October 1991 through May 1992. The purpose of the Phase I construction was to prepare the surface of the landfill for the construction of the final cap and gas venting system. Construction plans for the Phase I work were prepared by McSweeney & Drewes, Inc. The drawings are entitled "Site Preparation - Phase I of the Closure of the Cross Street Landfill", and dated December 1987.

The site preparation included the clearing and stabilization of the landfill surface against the formation of voids, settlement, and erosion. To accomplish this, the landfill was cleared of obstructions and graded. In several areas, waste fill was excavated from the perimeter of the cells and relocated within the cells to minimize their size. The waste fill was compacted using a vibratory sheepsfoot roller until the subgrade appeared visually

firm. Following the stabilization of the waste, a landfill cover was placed over the waste. The cover consisted of 12 to 24 inches of clean, coarse to fine sand fill overlain by 2 to 6 inches of sandy topsoil. The sand fill was obtained from on-site borrow areas and was compacted to 90 percent of its maximum dry density as determined by ASTM Test Method D-1557, The Modified Proctor Compaction Test. To aid in erosion protection, the landfill cover was seeded to promote the growth of light rooted vegetation.

The construction of drainage swales and basins were also incorporated into Phase I Construction. The excavation of on-site fill for the landfill cover facilitated the construction of the two drainage basins. Details of the swales, basins, and related piping are presented on the referenced drawings.

5.0 ENGINEERING EVALUATION

Based on our review of the subsurface and site conditions, and current regulations for landfill closures, we have performed a geotechnical engineering evaluation to develop recommendations for the proposed final cap and gas venting system. The following aspects of the project were evaluated:

A. Final Cap

1. Hydrology/Drainage
2. Stability
3. Settlement

B. Gas Venting System

1. Gas Emissions

In conjunction with our engineering evaluation, we have developed typical details and technical specifications for the final cap and gas venting system. Presented herein are the results of our evaluation:

5.1 Final Cap

The suitability of the two final cap alternates, clay and geosynthetic, were evaluated. Cross sections of the two cap alternatives are presented on Drawing Nos. 3 and 4. Our understanding of the Lakewood regional geology, along with verbal discussions with local clay fill suppliers, indicate that suitable, low permeability clay is limited within the immediate area, however, adequate supplies are available within 35 miles of the site. Materials required for the construction of a geosynthetic cap (topsoil, sand & HDPE liner) are readily available. Cost estimates for the two alternatives indicate the cost per acre to be approximately equal, provided all soils are imported. The geosynthetic alternative may have a cost benefit provided significant amounts of suitable sand is available on-site. Published literature indicates that landfill caps with geosynthetic liners tolerate greater differential settlements and, therefore, perform better over the long term.

Based upon our review of published literature and current practices in other New Jersey sanitary landfills, along with our prior experience with sanitary landfill caps, either alternative would be feasible. However, it is our opinion that the construction of a two-foot thick cap with a 40 mil HDPE membrane (Alternate No. 1) would be most appropriate for this project. Preliminary project meetings with representatives of the NJDEPE indicate that a geosynthetic cap is preferred.

Reference 13.18.20

FPA

TABLE NO. 1

HISTORICAL WASTE FLOW
INTO CROSS STREET LANDFILL

Time Period	Waste Type	Quantity
Jan. 1, 1973 - Dec. 31, 1973	Municipal Waste [1]	24,715 tons
	Bulky Waste	3,000 tons
	Construction & Demo	4,000 tons
Jan. 1, 1974 - Dec. 31, 1974	Municipal Waste	27,535 tons
	Dry Sewage Sludge	1,496 tons
	Bulky Waste	500 tons
Jan. 1, 1975 - Dec. 31, 1975	Municipal Waste	9,547 tons
	Bulky Waste	1,872 tons
	Construction & Demo	1,000 tons
	Liquid Sewage Sludge	1,588,800 gallons
Jan. 1, 1976 - Dec. 31, 1976	Municipal Waste	51,000 C.Y.
	Bulky Waste	25,128 C.Y.
	Liquid Sewage Sludge	1,200,000 Gallons
	Non-Hazardous Chemical Waste Liquids	2,500,000 Gallons
Jan. 1, 1977 - Dec. 31, 1977	Municipal Waste	155,730 C.Y.
	Bulky Waste	35,800 C.Y.
	Liquid Sewage Sludge	805,500 Gallons
	Non-Hazardous Chemical Waste Liquids	1,740,000 Gallons
Jan. 1, 1978 - Dec. 31, 1978	Solid Waste	177,415 C.Y.
Jan. 1, 1979 - Dec. 31, 1979	Solid Waste	235,538 C.Y.
Jan. 1, 1980 - Dec. 31, 1980	Solid Waste	369,205 C.Y.
	Liquid Sewage Sludge	121,060 Gal.

[1] Municipal Waste includes residential, commercial, and institutional.

Source: NJDEP - Solid Waste Administration

Reference 13 19/20

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APPENDIX A

BORING LOGS

Reference No. 20/20

BORING NO. PN-1
GROUND SURFACE ELEV. 81.0

1	0-4		MED. DENSE DAMP GRAY BROWN SANDY TOP SOIL 12" BROWN FINE SAND, TRACE M/F GRAVEL 2.5'
	6-6		
5			
2	5-11		DENSE DAMP REDDISH BROWN TO BROWN FINE SAND
	17-20		8.5'
10			HARD DAMP BROWN, TRACE RED SANDY CLAY 11.5'
3	10-11		
	12-19		▽ 12.5'
15			DENSE WET BROWN FINE SAND 19'
4	14-20		
	23-23		
20			
5	10-13		DENSE WET WHITE FINE SAND
	16-26		
25			
6	6-13		DENSE WET 27'
	16-23		END OF BORING AT 27'

BORING NO. PN-2
GROUND SURFACE ELEV. 97.0

1	1-3		LOOSE DAMP BROWN SANDY TOP SOIL 12", BROWN FINE SAND, TRACE CLAY 2.5'
	1-5		
5			
2	6-8		MED. DENSE DAMP REDDISH BROWN FINE SAND
	11-12		6'
10			DENSE DAMP BROWN FINE SAND
3	13-20		
	21-21		
15			VERY DENSE DAMP
4	17-32		
	44-42		
20			
5	1-3		▽ 21' LOOSE WET 21'
	6-6		SOFT MOIST ORANGE BROWN CLAY FINE SAND (LAYERS) 23'
25			VERY DENSE WET BROWN FINE SAND
6	12-23		
	41-40		
30			
7	8-23		VERY DENSE WET
	60-40		
35			
			END OF BORING AT 35'

BORING NO. PN-3
GROUND SURFACE ELEV. 92.0

1	1-2		MED. DENSE DAMP BROWN FINE SAND, TRACE MED. SAND 2'
	6-6		
2	16-20		VERY DENSE DAMP BROWN TO GRAY FINE SAND
	20-21		
3	22-26		VERY DENSE DAMP
	22-46		▽ 6.5'
5	8-15		6.5'
	18-23		DENSE WET ORANGE BROWN FINE SAND 8'
6	14-19		
	22-27		DENSE WET GRAY BROWN FINE SAND 12'
			GRAY BROWN FINE SAND w/TRACE LENSES OF CLAY 18'
8	1-2		LOOSE VERY WET GRAY FINE SAND
	3-4		22'
			END OF BORING AT 22'

BORING NO. PN-4
GROUND SURFACE ELEV. 92.2

1	1-3		MED. DENSE DAMP TAN BROWN FINE SAND 2.5'
	8-10		
5			MED. DENSE DAMP LIGHT ORANGE BROWN FINE SAND
2	7-14		
	22-19		▽ 8' 8'
10			MED. DENSE WET LIGHT BROWN FINE SAND 11.9'
3	11-9		
	8-13		STIFF MOIST ORANGE CLAY, TRACE FINE SAND 12.5'
15			VERY DENSE WET BROWN FINE SAND
4	8-10		
	26-41		
20			
5	8-18		DENSE WET 22'
	24-28		END OF BORING AT 22'

BORING NO. PN-5
GROUND SURFACE ELEV. 90.5

1	9-17		DENSE DAMP BROWN FINE-SAND, TRACE M/F GRAVEL, TRACE COAL FILL 2.5'
	15-24		
5			DENSE DAMP YELLOWISH BROWN FINE SAND
2	7-15		
	20-22		8'
10			MED. DENSE WET BROWN FINE, TRACE MED. SAND
3	13-15		
	21-24		▽ 11.5'
15			
4	5-4		MED. DENSE WET 14'
	9-27		HARD MOIST ORANGE BROWN CLAY 17'
20			MED. DENSE WET GREENISH BROWN FINE SAND
5	8-10		
	11-17		
25			
6	7-9		DENSE, WET 27'
	16-19		END OF BORING AT 27'

BORING NO. PN-6
GROUND SURFACE ELEV. 80.0

1	2-4		BROWN FINE SAND MED. DENSE, DAMP
	6-7		
5			
2	21-24		VERY DENSE, DAMP
	29-33		▽ 9'
10			VERY DENSE, WET 13.5'
3	14-28		
	20-27		
15			
4	24-27		VERY DENSE WET REDDISH BROWN FINE SAND 18.5'
	32-34		
20			VERY DENSE WET BROWN FINE SAND
5	8-18		
	24-32		
			END OF BORING AT 22'

BORING NO. PN-7
GROUND SURFACE ELEV. 87.0

1	2-3		LOOSE DAMP BROWN SANDY TOP SOIL 12", BROWN FINE SAND 2.5'
	3-5		
5			VERY DENSE DAMP REDDISH BROWN TO YELLOWISH BROWN F/C SAND, TRACE CLAY
2	9-17		
	31-32		8'
10			DENSE DAMP, TAN BROWN FINE, LITTLE MED. SAND
3	12-17		
	22-24		18'
15			VERY DENSE MOIST BROWN FINE SAND
4	24-20		
	24-34		▽ 19' 19'
20			MED. DENSE WET YELLOWISH ORANGE BROWN FINE SAND
5	5-7		
	7-10		22.5'
25			MED. DENSE WET REDDISH BROWN FINE, LITTLE MED. SAND 26'
6	6-6		
	8-18		STIFF MOIST WHITE AND RED CLAY LAYER 27.5'
30			DENSE WET BROWN FINE SAND
7	21-12		
	23-23		32'
			END OF BORING AT 32'

BORING NO. PN-8
GROUND SURFACE ELEV. 94.0

1	3-4		MED. DENSE DAMP BROWN FINE SAND
	5-7		3'
5			MED. DENSE DAMP TAN BROWN M/F, TRACE COARSE SAND
2	6-9		
	11-15		
10			DENSE, DAMP 12'
3	7-13		
	14-20		DENSE DAMP WHITE FINE SAND
15			
4	9-14		
	14-19		19'
20			STIFF MOIST TAN BROWN CLAY AND SAND
5	10-12		▽ 21.5' 21.5'
	16-16		DENSE WET BROWN FINE SAND, TRACE FINE GRAVEL 29'
25			DENSE WET BROWN FINE SAND
6	11-17		
	18-19		
30			
7	9-12		DENSE, WET
	18-20		32'
			END OF BORING AT 32'

BORING NO. PN-9
GROUND SURFACE ELEV. 95.8

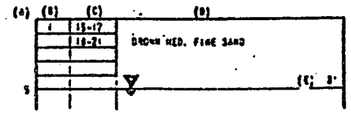
1	2-3		LOOSE DAMP GRAY SANDY TOP SOIL 20", BROWN FINE SAND
	3-3		
5			MED. DENSE, DAMP
2	5-9		
	11-15		
10			DENSE, DAMP
3	11-13		
	22-23		
15			DENSE, DAMP
4	11-17		
	17-23		
			GRAY & BROWN CLAY LAYER 19'
20			18.9'
5	10-14		DENSE DAMP BROWN FINE SAND 23'
	19-21		
25			▽ 24'
6	10-13		MED. DENSE WET REDDISH BROWN FINE SAND 25.5'
	11-11		
30			
7	8-16		VERY DENSE WET BROWN FINE SAND
	33-34		
35			
8	6-3		MED. DENSE WET 37'
	11-16		END OF BORING AT 37'

BORING NO. NGB-1
GROUND SURFACE ELEV. 106.0

			BROWN FINE SAND 1.46'
			MIXED WITH TRASH FILL
			WET MISC. FILL (WOOD, BRICK, STEEL, PAPER, CINDERS, GLASS) WET TO 6 FEET
40			40.0'
			GRAY FINE SAND MIXED WITH MISC. FILL (GAY) 43.0'
45			BROWN FINE DRY SAND
			▽ 48' 48'
50			BROWN FINE WET SAND 52'
55			YELLOWISH TAN BROWN FINE WET SAND
60			60'
			END OF BORING AT 60'

NOTE: SOIL BORINGS BY KEEGAN TECHNOLOGY AND TESTING ASSOCIATES, INC., NEWARK, N.J.

KEY TO LOG OF BORINGS



(A) DEPTH BELOW GROUND SURFACE
(B) SAMPLE NUMBER
(C) BLOWS ON SAMPLE SPOON PER 6" (15-17 INDICATES 15 BLOWS FROM 0" TO 6" AND 17 BLOWS FROM 6" TO 12")
(D) SOIL IDENTIFICATION
(E) APPROXIMATE DEPTHS OF STRATUM BOUNDARIES
▽ GROUND WATER LEVEL

Elson T. Killam Associates, Inc.
Environmental and Hydraulic Engineers
99 Wooster Street, Millburn, New Jersey, 07041

ALBERT J. MELLINI
Professional Engineer • N.J. Lic. No. 20179

BOARD OF CHOSEN FREEHOLDERS
OCEAN COUNTY, NEW JERSEY

REGIONAL SANITARY LANDFILL PLAN

SOIL BORING LOGS
NORTHERN LANDFILL SITE

DESIGNED	C.L.	DATE	REVISIONS DATE
DRAWN	F.M.D.		
CHECKED			
APPROVED			

JOB 76181 | SHEET 1 | SHEETS 1 | TOTAL 1

Elson T. Killam Associates, Inc. CONTRACT No. SC-1

REFERENCE NO. 14

Reference 14 1/6

STOCKED WATERS OF NEW JERSEY

1992

Listing of Fish Stocked In New Jersey's Lakes, Streams, Ponds and Rivers

The Division of Fish, Game and Wildlife is a professional, environmental organization dedicated to the protection, management and wise use of the state's fish and wildlife resources.

New Jersey Department of Environmental Protection & Energy
Division of Fish, Game and Wildlife

Reference 14 2/6

1991-1992
STOCKED WATERS

Total Number of Fish Stocked from All Sources
Key to Abbreviations

Bc	Black Crappie
Bkt	Brook Trout
Bnt	Brown Trout
Bs	Bluegill Sunfish
Chc	Channel Catfish
Lkt	Lake Trout
Lmb	Largemouth Bass
Np	Northern Pike
Rbt	Rainbow Trout
Sbh	Striped Bass Hybrid
Smb	Smallmouth Bass
Tm	Tiger Muskellunge
Wa	Walleye

ATLANTIC COUNTY
Birch Grove Park Pond—Northfield—1,860 Bkt
Hammonton Lake—Hammonton—2,670 Bkt

BERGEN COUNTY
AT&T Pond—Rochelle Park—200 Bs
Bergen County Park Pond—Wallington—200 Bs
Hackensack River—Lake Tappan to Harriot Ave., Harrington Park—955 Bkt, 855 Rbt
Hohokus Brook—Forest Rd. to Whites Pond—340 Bkt, 430 Rbt, 140 Bnt
Indian Lake—Little Ferry—800 Bkt, 1,060 Rbt
Liberty Park Pond—Upper Saddle River—200 Bs
Mill Pond—Park Ridge—710 Bkt, 630 Rbt
Pascack Creek—Orchard St., Hillsdale to Lake St., Westwood—870 Bkt, 750 Rbt
Pondside Park—Harrington—200 Bs
Ramapo River—State line to Pompton Lake—4,225 Bkt, 9,140 Rbt, 2,885 Bnt
Saddle River, Lower—Commons Office Complex Parking Lot, downstream to Grove St.—1,805 Bkt, 1,585 Rbt
Saddle River, Upper—Old Stone Church Rd., downstream to Post Office—720 Bkt, 630 Rbt, 130 Bnt
Tienekill Creek—Closter, entire length—430 Bkt, 240 Rbt
Twinney Park—Ridgewood—200 Bs
Whites Pond—Waldwick—740 Bkt, 970 Rbt, 600 Chc
Zabriskie Pond—Wyckoff—200 Bs

BURLINGTON COUNTY
Crystal Lake—Willingboro—950 Bkt, 1,240 Rbt
Rancocas Creek, Southwest Branch—Medford, Mill St. Park to Branch St. Bridge—590 Bkt, 520 Rbt
Rancocas Creek—Downstream of junction of North Branch and South Branch—1,616 Tm
Swedes Lake—Riverside—975 Chc
Sylvan Lake—Burlington—730 Bkt, 650 Rbt

Hockhocksen Brook—Tinton Falls, Hockhocksen Rd. to Garden State Parkway Bridge (northbound)—780 Bkt
Holmdel Park Pond—Holmdel Twp.—395 Bkt, 345 Rbt, 300 Chc
Lake Assunpink—Robbinsville—2,376 Sbh, 1,525 Chc
Macs Pond—Manasquan—200 Lmb
Manasquan Reservoir—Howell Twp.—2,010 Bkt, 1,760 Rbt
Manasquan River—Rt. 9 bridge downstream to Bennetts Bridge, Manasquan W.M.A.—3,165 Bkt, 5,270 Rbt, 3,025 Bnt
Mingamahone Brook—Farmingdale—Hurley Pond Rd. to Manasquan River—980 Bkt
Mohawk Pond—Red Bank—315 Bkt, 425 Rbt
Pine Brook—Tinton Falls, Jersey Central Railroad to Hockhocksen Brook—450 Bkt
Rising Sun Lake—Roosevelt—1,030 Chc
Shadow Lake—Red Bank—1,340 Chc
Shark River—Hamilton—Rt. 33 to Remsen Mill Rd.—1,950 Bkt
Spring Lake—Spring Lake—1,190 Bkt, 370 Rbt
Takanassee Lake—Long Branch—2,030 Bkt, 640 Chc
Topenemus Lake—Freehold—810 Bkt, 710 Rbt, 830 Chc
Veterans Memorial Park—Hazlet—200 Bs
Yellow Brook—Heyers Mill Rd. to Muhlenbrink Rd., Colts Neck Twp.—360 Bkt

MORRIS COUNTY

Beaver Brook—Rockaway, entire length—480 Bkt, 280 Rbt
Black River—Rt. 206, Chester to Dam at lower end of Hacklebarney State Park—2,065 Bkt, 2,845 Rbt, 1,050 Bnt
Budd Lake—Mount Olive Twp.—5,000 Lmb, 4,200 Np
Burnham Park Pond—Morristown—590 Bkt, 750 Rbt
Drakes Brook—Flanders, entire length—480 Bkt, 420 Rbt, 100 Bnt
Hibernia Brook—Hibernia, entire length—700 Bkt, 600 Rbt, 120 Bnt
India Brook—Mount Freedom to Rt. 24, Ralston, entire length—1,150 Rbt
Jefferson Park Pond—Milton—200 Bs
Lake Hopatcong—Lake Hopatcong—5,340 Rbt, 5,340 Bnt, 40 Chc
Lake Musconetcong—Netcong—1,180 Bkt, 1,020 Rbt
Mill Brook—Center Grove, entire length—660 Rbt
Mount Hope Pond—Mount Hope—720 Bkt, 620 Rbt
Passaic River—White Bridge to Dead River—2,170 Bkt, 1,860 Rbt
Raritan River, S/B Upper—Rt. 46 downstream to Scott Park—1,970 Bkt, 2,600 Rbt, 910 Bnt
Rockaway River—Longwood Lake Dam to Jersey City Res. in Boonton—8,780 Bkt, 7,355 Rbt, 5,505 Bnt
Russia Brook—Jefferson Twp., Ridge Rd. to Lake Swannanoa—200 Bkt, 100 Rbt
Silas Condict Park Pond—Kinnelon—600 Chc
Speedwell Lake—Morristown—910 Bkt, 1,170 Rbt
Whippany River, Lower—Whitehead Rd. Bridge, downstream to Lake Rd.—680 Bkt, 340 Rbt
Whippany River, Upper—Tingley Rd. Bridge, downstream to Whitehead Rd. Bridge—360 Bkt, 180 Rbt

OCEAN COUNTY

Brick Lake Park Pond—Brick—200 Bs
Colliers Mill Pond—Colliers Mills—740 Chc
Lake Shenandoah—Lakewood Ocean County Park—1,010 Bkt, 890 Rbt

Reference 14 4/6

Metedeconk River, N/B—Aldrich Rd. Bridge to Ridge Ave.—5,635 Bkt
Metedeconk River, S/B—Bennets Mills Dam to twin wooden foot bridge, opposite Lake Park Blvd. on South Lake Dr., Lakewood—5,085 Bkt
Prospertown Lake—Prospertown—1,170 Bkt, 1,300 Chc
Shannoc Pond—Colliers Mills—400 Lmb
Toms River—Ocean County Rt. 528, Holmansville to Ocean County Rt. 571—5,400 Bkt
Turn Mill Pond—Colliers Mills—1,400 Chc

PASSAIC COUNTY

Barbour's Pond—West Paterson—730 Bkt, 650 Rbt
Clinton Reservoir—Newark Watershed—400 Bkt, 520 Rbt, 1,840 Bnt, 15,150 Smb
Echo Lake Reservoir—West Milford—7,875 Smb
Goffle Brook Park Pond—Hawthorne—200 Bs
Green Turtle Pond—Hewitt—1,050 Chc
Greenwood Lake—West Milford—2,080 Rbt, 1,040 Bnt, 3,280 Chc, 80,000 Wa
Monksville Reservoir—Hewitt—1,010 Rbt, 3,030 Bnt, 52,000 Wa
Oldham Pond—North Haledon—760 Bkt, 670 Rbt, 660 Chc
Pequannock River—Rt. 23, Smoke Rise to Peterson-Hamburg Turnpike, Pompton Lakes—2,900 Bkt, 2,490 Rbt, 1,340 Bnt
Pompton Lake—Pompton Lake—770 Bkt, 660 Rbt, 2,240 Np
Pompton River—Pompton Lake to Newark-Pompton Turnpike—2,660 Bkt, 2,280 Rbt
Ringwood Brook—State line to Sally's Pond, Ringwood Park—250 Bkt, 300 Rbt, 200 Bnt
Sheppard's Lake—Thunder Mountain—Ringwood Borough—560 Rbt, 1,680 Bnt
Wanaque River, Lower—Ringwood Ave., downstream to Hershfield Park—700 Bkt, 1,150 Rbt, 1,550 Bnt
Wanaque River, Upper—Greenwood Lake Dam, downstream to, and including, East Shore Drive—1,080 Bkt, 1,750 Rbt, 1,890 Bnt

SALEM COUNTY

Maurice River—Willow Grove Lake Dam to Sherman Ave., Vineland—2,070 Bkt
Schadler's Sand Wash Pond—Pennsgrove—1,260 Bkt
Woodstown Lake—Woodstown—815 Chc

SOMERSET COUNTY

Ann Van Middleworth Pond—Hillsborough—200 Bs
Delaware Raritan Canal—Griggstown to Bound Brook—6,955 Lmb
Harrison Brook—Liberty Corner, entire length—190 Bkt, 190 Rbt
Johnson Park Pond—Piscataway—200 Bs
Lamington River—Route 523 (Lamington Rd.) at Burnt Mills to Jct. with the N/B of Raritan River—670 Bkt, 570 Rbt
Mettlers Pond—East Millstone—200 Bs
Middle Brook, East Branch—Martinsville, entire length—300 Bkt, 150 Rbt
Passaic River—White Bridge to Dead River—2,170 Bkt, 1,860 Bnt
Peapack Brook—Peapack, entire length—820 Bkt, 600 Rbt
Raritan River—Jct. of Raritan River North Branch and South Branch to Dam at Edgewater Rd.—1,770 Bkt, 1,530 Rbt
Raritan River, N/B—Peapack Rd. Bridge in Far Hills to Junction with S/B Raritan River—8,925 Bkt, 5,640 Rbt, 3,100 Bnt
Raritan River, S/B Lower—Rt. 31 Bridge, downstream to S/B—4,000 Bkt, 5,345 Rbt, 1,955 Bnt

Reference 14 5/6

List of Warmwater and Coolwater Sportfish Raised at the Charles O. Hayford Fish Hatchery and Stocked During 1985-1989

by Walter S. Murawski

This list shows those stockings that should be ready for angling during the early 1990s. Stocking of these and other waters have been ongoing since 1989, however, only those waters stocked prior to 1990 are shown, because they should contain populations of the stocked species that are now legally harvestable. The list does not include forage species or sunfish, which are stocked primarily for fishing derbies.

All the fish listed below were stocked as young or yearling fish.

Species and Location Stocked	Year(s) Stocked
Channel Catfish	
Bergen County	
Whites Pond	1987, 88
Camden County	
Haddon Lake	1987
Cumberland County	
Bostwick Lake	1989
Giampetro Park Pond	1989
Mary Elmer Lake	1989, 85
Sunset Lake	1988, 87
Essex County	
Branch Brook Park Pond	1988, 87
Diamond Mill Pond	1988
Verona Park Pond	1988, 87
Gloucester County	
Greenwich Lake	1989
Harrisonville Lake	1987, 85
Swedesboro Lake	1988
Hudson County	
West Hudson Park Pond	1989, 86
Woodcliff Lake	1989, 86
Hunterdon County	
Amwell Lake	1987
Mercer County	
Carnegie Lake	1988
Colonial Lake	1987
D&R Canal, 10 mi. Lock	1989
D&R Canal, 3 mi. Lock	1989
Gropps Lake	1989
Mercer Lake	1987
Peddie Lake	1987
Rosedale Lake	1988, 87, 86
Whitehead Pond	1988
Middlesex County	
East Brunswick Park Pond	1989
Farrington Lake	1989
Roosevelt Park Pond	1988
Spring Lake	1987
Weston Mill Pond	1989

Species and Location Stocked	Year(s) Stocked
Channel Catfish—continued	
Monmouth County	
Allentown Pond	1989
Como Lake	1988
Deal Lake	1989
Holmdel Park Pond	1988
Lake Assunpink	1988, 85
Rising Sun Lake	1988
Shadow Lake	1989
Stone Tavern Lake	1988
Takanassee Lake	1989, 87
Topenemus Lake	1988
Morris County	
Mount Hope Pond	1988
Silas Condit Park Lake	1989
Speedwell Lake	1987
Ocean County	
Colliers Mill Pond	1988
Prospertown Lake	1989
Turnmill Pond	1988
Passaic County	
Barbours Pond	1987
Green Turtle Pond	1989
Greenwood Lake	1989
Oldham Pond	1989
Pompton Lake	1988, 87
Salem County	
Woodstown Lake	1985
Somerset County	
Spooky Brook Lake	1989
Union County	
Milton Lake	1989, 85
Surprise Lake	1987
Upper Echo Park Pond	1989
Warren County	
Columbia Lake	1989, 87
Furnace Lake	1989, 87, 85

Reference 14 6/6

List of Warmwater and Coolwater Sportfish Raised at the Charles O. Hayford Fish Hatchery and Stocked During 1985-1989

by Walter S. Murawski

This list shows those stockings that should be ready for angling during the early 1990s. Stocking of these and other waters have been ongoing since 1989, however, only those waters stocked prior to 1990 are shown, because they should contain populations of the stocked species that are now legally harvestable. The list does not include forage species or sunfish, which are stocked primarily for fishing derbies.

All the fish listed below were stocked as young or yearling fish.

Species and Location Stocked	Year(s) Stocked
Channel Catfish	
Bergen County	
Whites Pond	1987, 88
Camden County	
Haddon Lake	1987
Cumberland County	
Bostwick Lake	1989
Giampetro Park Pond	1989
Mary Elmer Lake	1989, 85
Sunset Lake	1988, 87
Essex County	
Branch Brook Park Pond	1988, 87
Diamond Mill Pond	1988
Verona Park Pond	1988, 87
Gloucester County	
Greenwich Lake	1989
Harrisonville Lake	1987, 85
Swedesboro Lake	1988
Hudson County	
West Hudson Park Pond	1989, 86
Woodcliff Lake	1989, 86
Hunterdon County	
Amwell Lake	1987
Mercer County	
Carnegie Lake	1988
Colonial Lake	1987
D&R Canal, 10 mi. Lock	1989
D&R Canal, 3 mi. Lock	1989
Gropps Lake	1989
Mercer Lake	1987
Peddie Lake	1987
Rosedale Lake	1988, 87, 86
Whitehead Pond	1988
Middlesex County	
East Brunswick Park Pond	1989
Farrington Lake	1989
Roosevelt Park Pond	1988
Spring Lake	1987
Weston Mill Pond	1989

Species and Location Stocked	Year(s) Stocked
Channel Catfish—continued	
Monmouth County	
Allentown Pond	1989
Como Lake	1988
Deal Lake	1989
Holmdel Park Pond	1988
Lake Assunpink	1988, 85
Rising Sun Lake	1988
Shadow Lake	1989
Stone Tavern Lake	1988
Takanassee Lake	1989, 87
Topenemus Lake	1988
Morris County	
Mount Hope Pond	1988
Silas Condit Park Lake	1989
Speedwell Lake	1987
Ocean County	
Colliers Mill Pond	1988
Prospertown Lake	1989
Turnmill Pond	1988
Passaic County	
Barbours Pond	1987
Green Turtle Pond	1989
Greenwood Lake	1989
Oldham Pond	1989
Pompton Lake	1988, 87
Salem County	
Woodstown Lake	1985
Somerset County	
Spooky Brook Lake	1989
Union County	
Milton Lake	1989, 85
Surprise Lake	1987
Upper Echo Park Pond	1989
Warren County	
Columbia Lake	1989, 87
Furnace Lake	1989, 87, 85

REFERENCE NO. 15

11046/2-91

RECORD OF TELEPHONE CONVERSATION

Reference 15 1/1

DATE 4-24-95

TO Department of Environmental Protection
Ground Water Quality Management
NAME/FILE NO.

FROM Joseph Gray

CLIENT/PROJECT Lakewood Township Landfill / Ocean County Landfill

SUBJECT Wellhead Protection Areas

CHARGE: DEPT. NO. _____ CLIENT SYMBOL _____ OFS NO. _____

DISCUSSION WITH Tom McKee

Tom stated that rules for defining wellhead protection areas in NJ have not be finalized, therefore wellhead protection areas have not been defined in NJ.

BY Joseph Gray
NAME

Asst. Engineer
TITLE

DEPT. NO.

CC:

REFERENCE NO. 16

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
HAZARDOUS SITE MITIGATION ADMINISTRATION
CN 028, Trenton, N.J. 08625

JORGE H. BERKOWITZ, PH.D.
ADMINISTRATOR

MARWAN MASADA
DIRECTOR

17 JUL 1985

09 JUL 1985

MEMORANDUM

TO: ROBERT KUNZE, ACTING ASSISTANT CHIEF
SITE EVALUATION UNIT

FROM: ROBERT HAYTON, HSMS III
SITE EVALUATION UNIT

SUBJECT: CHEMICAL WASTE LIQUID DISPOSAL AT LAKEWOOD S.L.F.

During a routine file search for the Lakewood Township SLF (1514A) HRS documentation record, information was acquired regarding liquid chemical waste dumping at the facility. I contacted Mr. Gilbert Carlson, Superintendent of Public Works for Lakewood, who acknowledged that Fluid Packaging (a/k/a Fluid Chemical) had disposed of over 4 million gallons of chemical waste liquids (ID #77) at the Lakewood Landfill in 1976 and 1977 as per the attached annual reports. He seemed to think that the material disposed of was cleaning solvents generated by the company.

On June 18, 1985, a follow up site reconnaissance was scheduled with Guy Tomasoni, DWR, Bureau of Groundwater Discharge Permits, Kenneth Kloo, HSMA-SEU, and myself. The purpose of the visit was to identify and confirm monitoring well locations. At the site we met a person named Ed, a public works employee, who was in charge of the landfill during its operation. During the visit I questioned Ed about chemical dumping at the facility. He stated that Fluid Packaging Company would bring tanker trucks to the site and unload their contents into specially prepared "Filter Pits" in the rear, southern most part of the facility. The so-called "Filter Pits" were nothing more than deep trenches excavated in the sand by landfill personnel. He stated that Fluid Packaging was the only company that he knew of to dispose of liquid chemical wastes in the landfill.

HS69:dc

cc: Lakewood SLF File

Reference LC 215

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOLID WASTE ADMINISTRATION
P.O. BOX 2807, TRENTON, N.J. 08625

ANNUAL OPERATIONAL STATEMENT for a SOLID WASTE FACILITY

INFORMATION ON FILE FROM LAST YEAR - CORRECT IN SECTION B

1. Facility Registration
2. Registrant's Telephone No.
3. Registrant's Fed. Employer I.D. or Soc. Sec. No.
4. Public Utilities Commission License No.
5. Registrant's Name
6. Company or Trade Name
7. Street Address
8. City, State Zip Code

FOR OFFICE USE

9. Type of Organization
10. Corporate Data
    a. Registered in
    b. Date of filing
    c. Agent's Name
    d. Agent's Street Address
    e. Agent's City, State, Zip Code
    f. Agent's Telephone No.
11. a. Name Person with Prime Admin. Authority
    b. Telephone Number of 11a.

SECTION A

THIS SECTION FOR CORRECTIONS TO SECTION A — PLEASE TYPE OR PRINT

1. Facility Registration (Office Use Only) 1514A
2. Registrant's Area Code and Telephone Number 201 363 0557 — 216 000 784
3. Registrant's Federal Employer I.D. or Social Security No.: [X] FEID or [ ] SS No.
4. Public Utilities Commissic 1514A
5. Registrant's Name: Last CARLSON First GILBERT Init. J
6. Company or Trade Name TOWNSHIP of LAKEWOOD
7. Street Address or Box Number Municipal Bldg., 231 Third St.
8. City Lakewood State N. J. Zip Code 08701
9. Type of Organization - Check One: A. [ ] Proprietor, B. [ ] Partnership, C. [ ] Incorporated, D. [X] Municipality, E. [ ] County, F. [ ] State Government, G. [ ] Authority, H. [ ] Federal Government, X. [ ] Other
10. Corporate or Partnership Data (if any):
    a. Registered in State of _____ , County of _____
    b. Date of Filing _____
    c. Agent's Name: Last _____ First _____ Init. _____
    d. Agent's Street Address or Box Number _____
    e. Agent's City _____ State _____ Zip Code _____
    f. Agent's Area Code and Telephone Number _____ _____ _____
11. Person Having Prime Administrative Authority
    a. Name: Last LaPointe First Thomas Init. L.
    b. Area Code and Telephone Number 201 364 2500

SECTION C

1. Type of facility: A. [X] Sanitary Landfill, B. [ ] Incinerator, C. [ ] Compost, D. [ ] Chemical Processing & Treatment, E. [ ] Resource Recovery, F. [ ] Transfer Station, G. [ ] Shredder, H. [ ] Baler, I. [ ] Sludge Farm, J. [ ] Disruption, X. [ ] Other
2. Name of Facility Lakewood Township Landfill
3. Location (Street) Kennedy Ave.
   (Municipality) Lakewood (County) Ocean
4. Estimated Remaining Life (Years) 10 (Tons) 200 000
5. Is Property Leased? [ ] Yes, [X] No, If Yes, Answer (a) and (b)
   (a) Owner's Name (Last) (First) M.I.
   (b) Owner's Address (Street)
   (Municipality) (State) (Zip)

ATTACH

Reference 16 3/5

V:W:04

WASTE DISPOSED REPORT

FACILITY REGISTRATION NUMBER 1514A

1514A

WASTE DISPOSED OF DURING THE PRECEDING YEAR (January1 thru December 31)

SECTION D

SOLIDS		CUBIC YARDS (as delivered)		
		COMPACTED	NON-COMPACTED	SUB-TOTAL
10. Municipal (Household, Commercial and Institutional)	10.	51,000		51,000
12. Dry Sewage Sludge	12.			
13. Bulky Waste	13.		25,128	25,128
17. Hazardous Waste - Dry	17.			
18. Chemical Waste - Dry (Non - Hazardous)	18.			
23. Vegetative Waste	23.			
25. Animal and Food Processing Wastes	25.			
26. Oil Spill Clean-up Wastes	26.			
27. Industrial (Non-Chemical)	27.			
			TOTAL SOLIDS	76,128

SEPTAGE		GALLONS
73. Septic Tank Clean-Out Wastes	73.	
74. Liquid Sewage Sludge	74.	1,200,000
	TOTAL	

LIQUIDS		GALLONS
70. Waste Oil and Sludge	70.	
72. Bulk Liquid and Semi-Liquids	72.	
76. Hazardous Waste Liquids	76.	
77. Chemical Waste Liquids	77.	2,500,000
	TOTAL	

SECTION E

I certify that the information contained herein is true to the best of my knowledge.

Signature G. J. Carlson Date 7-19-77

Name typed Gilbert J. Carlson Title Supt.

SECTION F

FOR OFFICIAL USE ONLY

	TONS PER YEAR		TONS PER YEAR
10.	17850	23.	
12.		25.	
13.	5026	26.	
17.		27.	
18.		TOTAL	22876

FOR OFFICE USE

Reference 16
415

VSW 004 Rev. 2/77

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOLID WASTE ADMINISTRATION
P.O. BOX 2807, TRENTON, N.J. 08625

ANNUAL OPERATIONAL STATEMENT for a SOLID WASTE FACILITY

SECTION A

INFORMATION ON FILE FROM LAST YEAR - CORRECT IN SECTION B

1. 1514A
2. (201) 363-0557
3. FEID 216000784
4. 1514A
5. CARLSON GILBERT J
6. TOWNSHIP OF LAKEWOOD
7. MUNICIPAL BLDG 231 THIRD ST
8. LAKEWOOD NJ 08701
9. MUNICIPALITY
10. A.
    B.
    C.
    D.
    E.
    F.
11. A. LAPOINTE THOMAS L
    B. (201) 364-2500

1. Facility Registration
2. Registrant's Telephone No.
3. Registrant's Fed. Employer I.D. or Soc. Sec. No.
4. Public Utilities Commission License No.
5. Registrant's Name
6. Company or Trade Name
7. Street Address
8. City, State, Zip Code
9. Type of Organization
10. Corporate Data
    a. Registered in
    b. Date of filing
    c. Agent's Name
    d. Agent's Street Address
    e. Agent's City, State, Zip Code
    f. Agent's Telephone No.
11. a. Name Person with Prime Admin. Authority
    b. Telephone Number of 11a.

FOR OFFICE USE

SECTION B

THIS SECTION FOR CORRECTIONS TO SECTION A — PLEASE TYPE OR PRINT

1. Facility Registration (Office Use Only)
2. Registrant's Area Code and Telephone Number 201 363 0557
3. Registrant's Federal Employer I.D. or Social Security No.: ☒ FEID, or ☐ SS No. 216 000 784
4. Public Utilities Commission License Number 1514A
5. Registrant's Name: Last Township of Lakewood First _____ Init. _____
6. Company or Trade Name _____
7. Street Address or Box Number Municipal Bldg., 231 Third St.
8. City Lakewood, N. J. State _____ Zip Code 08701
9. Type of Organization - Check One: A. ☐ Proprietor, B. ☐ Partnership, C. ☐ Incorporated, D. ☒ Municipality, E. ☐ County, F. ☐ State Government, G. ☐ Authority, H. ☐ Federal Government, X. ☐ Other
10. Corporate or Partnership Data (if any):
    a. Registered in State of _____, County of _____
    b. Date of Filing _____
    c. Agent's Name: Last _____ First _____ Init. _____
    d. Agent's Street Address or Box Number _____
    e. Agent's City _____ State _____ Zip Code _____
    f. Agent's Area Code and Telephone Number _____ _____ _____
11. Person Having Prime Administrative Authority
    a. Name: Last LaPointe First Thomas Init. L.
    b. Area Code and Telephone Number 201 364 2500

SECTION C

1. Type of facility: A. ☒ Sanitary Landfill, B. ☐ Incinerator, C. ☐ Compost, D. ☐ Chemical Processing & Treatment, E. ☐ Resource Recovery, F. ☐ Transfer Station, G. ☐ Shredder, H. ☐ Baler, I. ☐ Sludge Farm, J. ☐ Disruption, X. ☐ Other
2. Name of Facility Lakewood Township Landfill
3. Location (Street) Kennedy Ave.
   (Municipality) Lakewood (County) Ocean
4. Estimated Remaining Life (Years) 8 (Tons)
5. Is Property Leased? ☐ Yes, ☒ No, If Yes, Answer (a) and (b)
   (a) Owner's Name (Last) (First) M.I.
   (b) Owner's Address (Street)
   (Municipality) (State) (Zip)

Reference 16 5/5

WASTE DISPOSED REPORT

FACILITY REGISTRATION NUMBER 8002

WASTE DISPOSED OF DURING THE PRECEDING YEAR (January1 thru December 31) 1977

SECTION I

SOLIDS

		CUBIC YARDS (as delivered)		
		COMPACTED	NON-COMPACTED	SUB-TOTAL
10.	Municipal (Household, Commercial and Institutional)	155,730		155,730
12.	Dry Sewage Sludge			
13.	Bulky Waste		35,800	35,800
17.	Hazardous Waste - Dry			
18.	Chemical Waste - Dry (Non - Hazardous)			
23.	Vegetative Waste			
25.	Animal and Food Processing Wastes			
26.	Oil Spill Clean-up Wastes			
27.	Industrial (Non-Chemical)			
			TOTAL SOLIDS	191,530

SEPTAGE

		GALLONS
73.	Septic Tank Clean-Out Wastes	
74.	Liquid Sewage Sludge	805,500
	TOTAL	805,500

LIQUIDS

		GALLONS
70.	Waste Oil and Sludge	
72.	Bulk Liquid and Semi-Liquids	
76.	Hazardous Waste Liquids	
77.	Chemical Waste Liquids	1,740,000
	TOTAL	

SECTION II

I certify that the information contained herein is true to the best of my knowledge.

Signature Gilbert J Carlson Date 7-13-78

Name typed Gilbert J. Carlson Title Supt.

SECTION III

FOR OFFICIAL USE ONLY

	TONS PER YEAR		TONS PER YEAR
10.		23.	
12.		25.	
13.		26.	
17.		27.	
18.		TOTAL	

FOR OFFICE USE

REFERENCE NO. 17

O R A N D U M

State of New Jersey
Department of Environmental Protection

Ref 17

File

INVESTIGATIVE REPORT

1/7

M J. TROCKI DATE: 2-7-77

JECT: LAKEWOOD TWP. SLDA

5.1	At the time of this inspection three active working areas were being utilized. One for liquid chemical waste, one for household refuse and the other for cars. (see map)
6-2.5.6	No measures are being taken to control the blowing of litter. A large amount of litter is being blown near the disposal site.
2.5.13	Two side slopes of this disposal site are not properly covered. One side slope for approx. 200' is fully exposed. The other side slope approx 60' in length. has an inadequate intermediate cover. Tree parts are protruding through the cover that has been applied.
	NOTE: Liquid waste (chemical) is being lagooned on the SLDA.

ATTACHMENT D

Dave R. Dent

Reference 17 2/7

State of New Jersey
Department of Environmental Protection

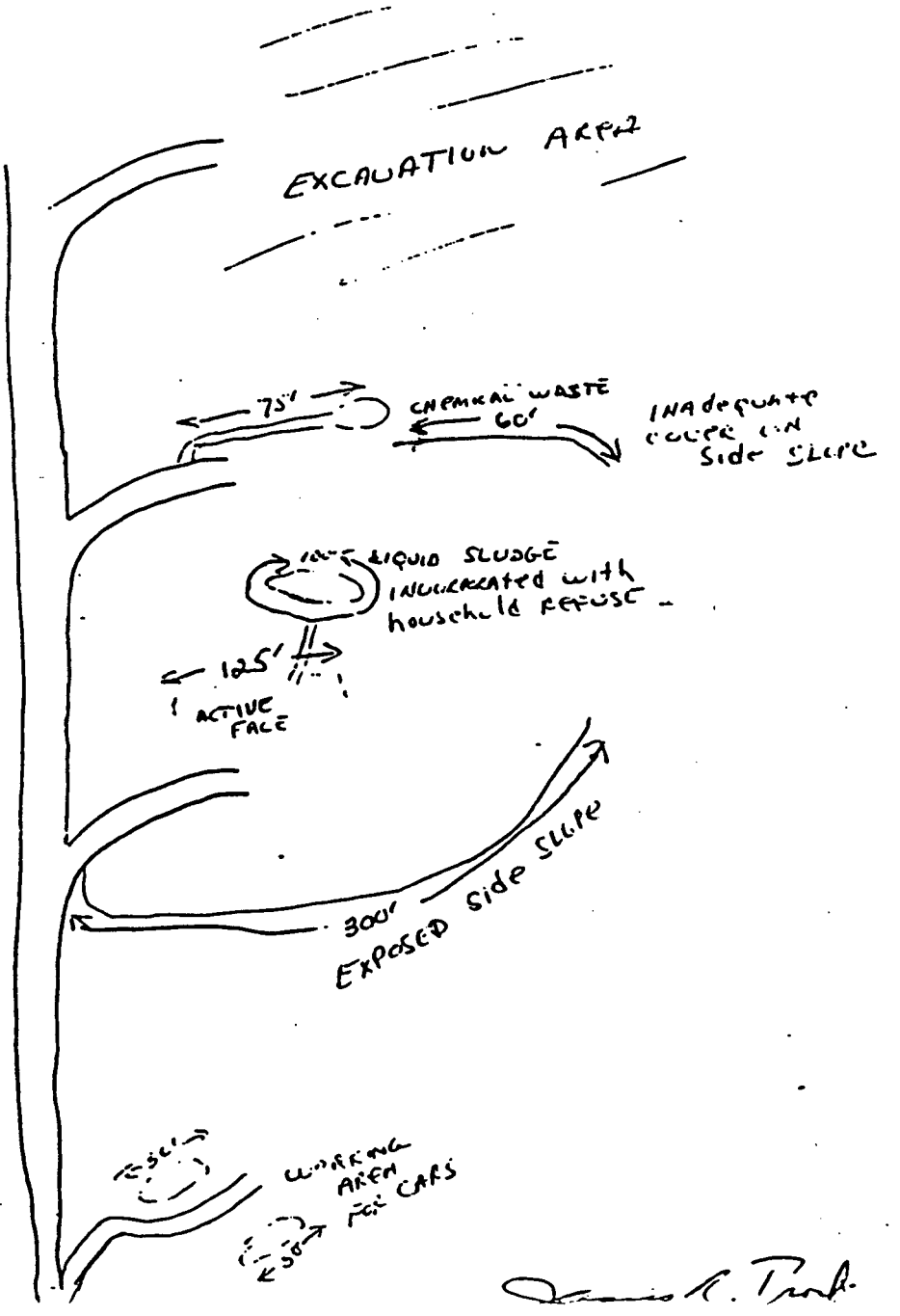
R A N D U M

File

M J. TROCKI

DATE: 2-7-77

JECT: Lakewood Twp. Supt.



Reference #7 3/7
Ref. -15

Lakewood Township SLF is located in Lakewood, Ocean County, New Jersey. In 1976 and 1977 the facility accepted 4,290,000 gallons of liquid chemical wastes. The site in underlain by the Cohansey/Kirkwood aquifers which are used as a major water supply for the surrounding communities. These aquifers are typified by quartz sands mixed with scattered beds of clay and gravel. The residences immediately surrounding the landfill all have their own water supply. The site was closed in 1984.

Reference 174/7

1514A

MEMORANDUM

State of New Jersey
Department of Environmental Protection

TO: File

INVESTIGATIVE REPORT

FROM: Robert Leary

DATE: 3/1/77

SUBJECT: Lakewood Twp.
Cross St.
Lakewood Twp, Ocean County

I. This investigation is made to determine if this S.W.D.A. is in compliance with a N.O.P. dated 11/19/76 specifically 7:26-2.5.1, 2.5.6, 2.5.13, 2.6.11, 2.6.12, 2.8.2, and 2.8.3.

II. The investigation of Lakewood Twp. S.W.D.A. on 3/1/77 revealed the following deficiencies:
7:26-2.5.6 While some progress has been made in removed litter from the eastern boundary of the site. Litter still exists in this area for a distance of at least 800'-900'. A dozer is working in the pit owned by Houdaille Industries and covering litter in that area. Also a work crew is removing litter from the woods.
7:26-2.5.13 Many areas of this site that were open are now covered. Two areas on the northern slope of this site are still open, one approx. 20' long and 12' high and the other 40' long and 12'-15' high. These areas are mainly tree parts and wood. Also some tree parts are still exposed on the upper portion of several side slopes. The [illegible]

Reference 19 5/7

1514A (2)

MEMORANDUM

State of New Jersey
Department of Environmental Protection

TO: File

INVESTIGATIVE REPORT

FROM: Robert Leary

DATE: 3/1/77

SUBJECT: Lakewood Twp.

site still has some ties protruding through the existing cover material. The large accumulation of ties on the west side of the access road is to be used for liquid wastes when it is properly prepared and covered. I told the landfill operator that the liquid could go in this area if it was properly covered instead of going into the working face.

V. Observations: The working face is now located in the low area between fingers to control litter. The working face is narrow and of the proper size. The former working area is well covered. Two dump trucks were hauling cover on the site. While this site is not yet in full compliance with the N.O.P. considerable progress has been made in correcting the violations.

Robert Leary

Reference 17 6/7

1514A

MEMORANDUM

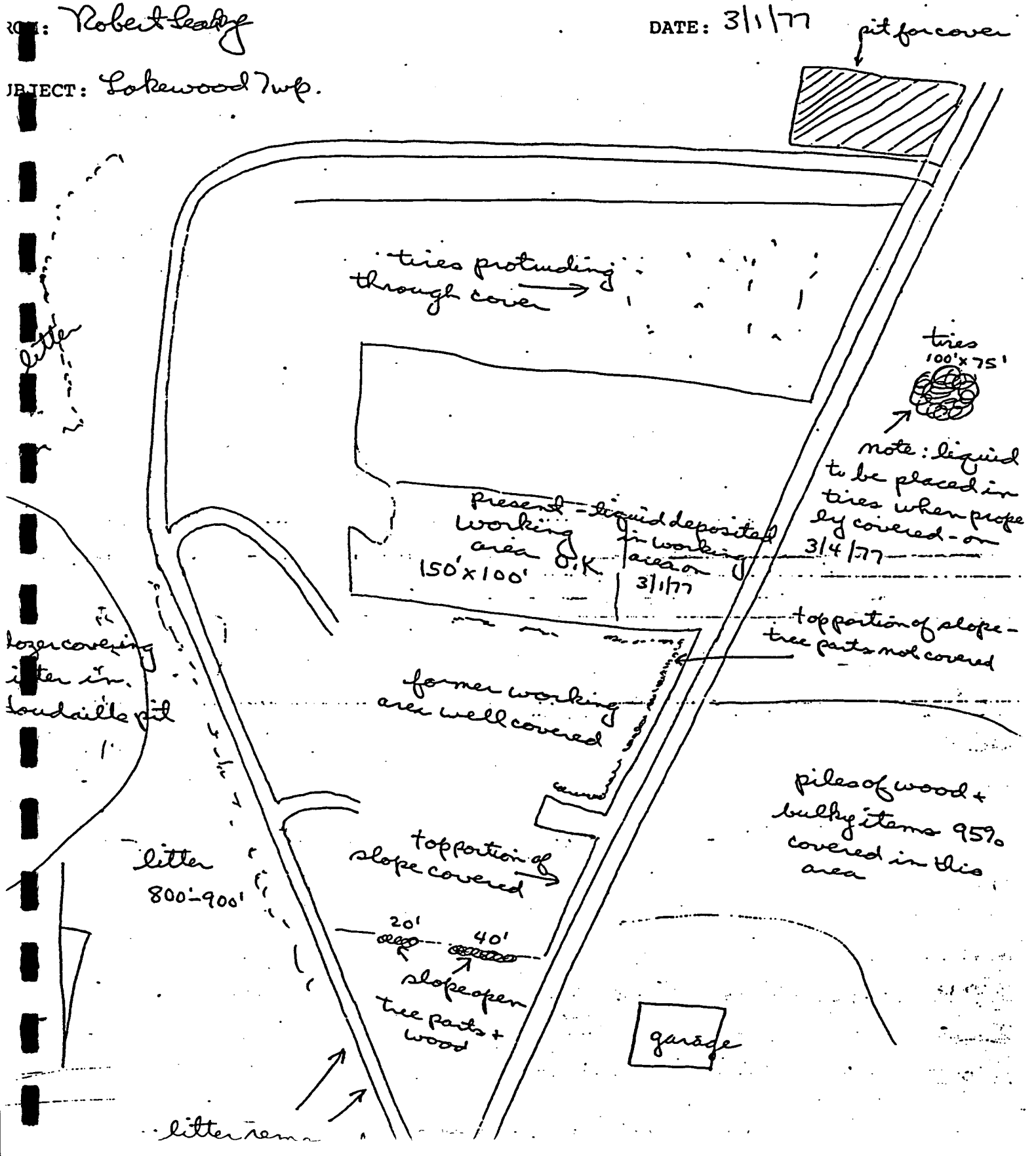
State of New Jersey
Department of Environmental Protection

To: file

From: Robert Leahy

DATE: 3/1/77

Subject: Lakewood Twp.



Reference 17 7/7

1514A

State of New Jersey
Department of Environmental Protection

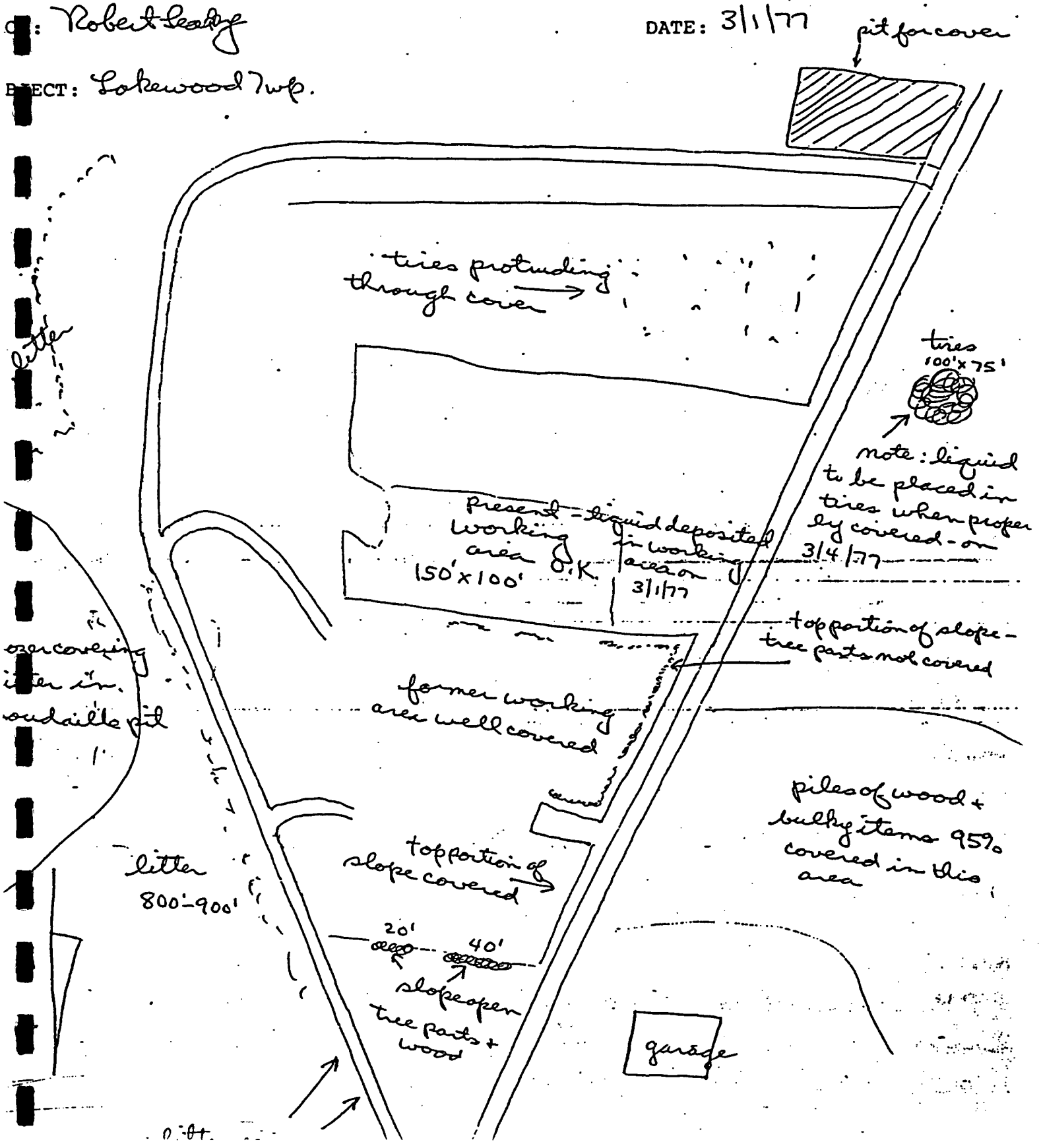
MEMORANDUM

: file

: Robert Leahy

DATE: 3/1/77

BJECT: Lakewood Twp.



REFERENCE NO. 18

REF 18
1/33

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF HAZARDOUS WASTE MANAGEMENT
John J. Trela, Ph.D., Director
401 East State St.
CN 028
Trenton, N.J. 08625
609 - 633 - 1408

M E M O R A N D U M

TO: Cindy Pfleiderer, Senior Environmental Specialist
Bureau of Ground Quality Management Compliance Section

OCT 29 1987

FROM: Ray Nichols, Senior Environmental Specialist
Bureau of Planning and Assessment
Division of Hazardous Waste Management

Ray Nichols

SUBJECT: LAKEWOOD LANDFILL
LAKEWOOD, OCEAN COUNTY
NJPDES #55166

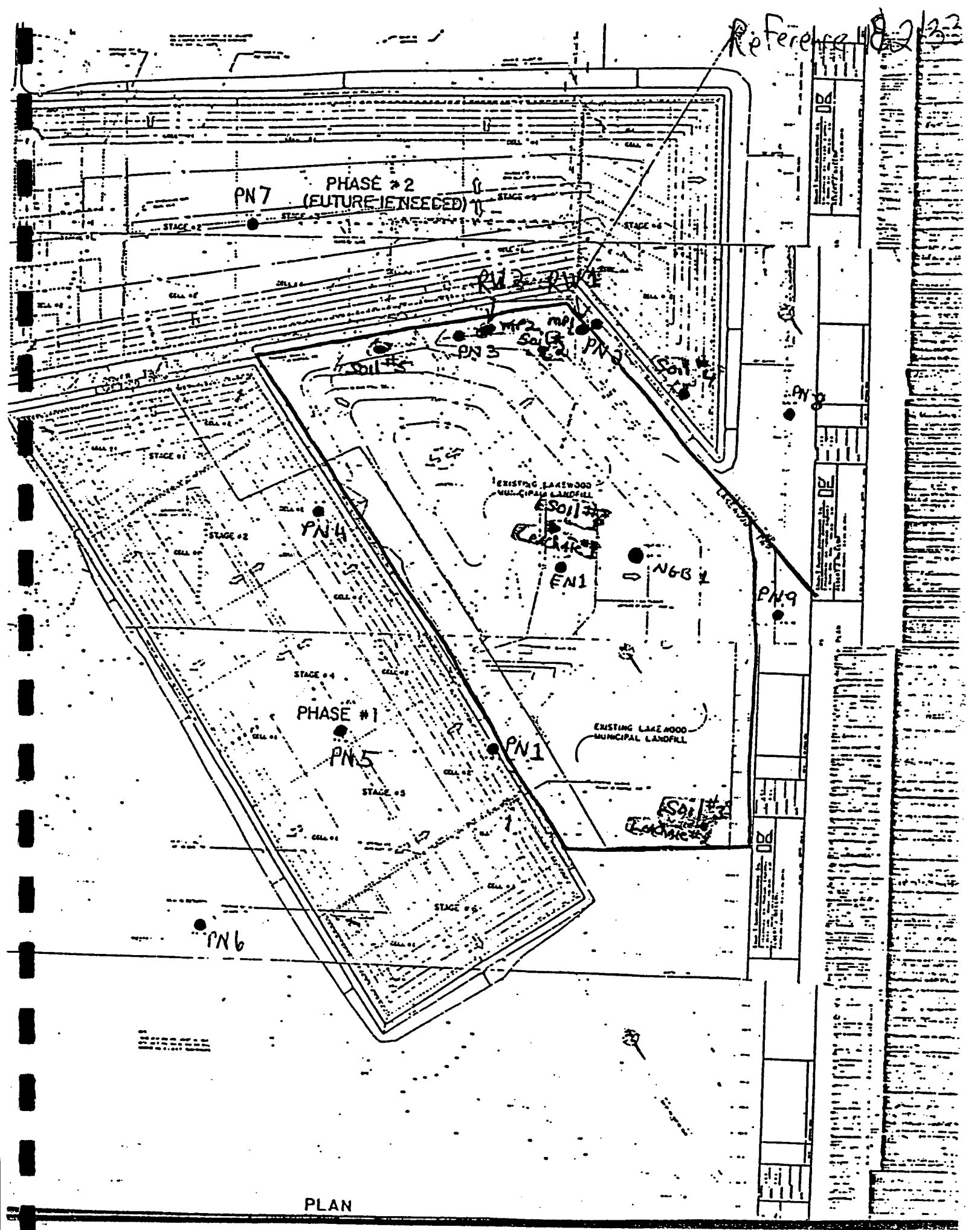
Pursuant to our telephone conversation on October 27, 1987 attached please find a copy of the sampl analysis from the sampling episode conducted by this Bureau on October 17, 1985, together with a map of this site showing sample locations.

I appreciated learning from you that your section has the lead for monitoring compliance by this landfill with the NJPDES Permit requirements and that this landfill is not among those which have been referred to the DWR Enforcement Element.

If you have any questions about the data or the information on this site which this Bureau has developed, feel free to call me at 2-4404.

RN:mz
Attachment

c: Albert Pleva


Reference 8.2.3.2
PHASE #2
(FUTURE IF NEEDED)
PN7
PN3
PN2
PN4
PN9
PN1
PN5
PN6
EN1
EXISTING LAKEWOOD MUNICIPAL LANDFILL
PHASE #1
STAGE #1
STAGE #2
STAGE #3
STAGE #4
STAGE #5
STAGE #6
PLAN

Reference 18 3/33

I. Preparatory Factors and Data Qualifications

Preparatory Factors

Volatile Organics

Sample No.	Preparatory Factor, wt., g/final vol., mls	Volume Purged
solid method blank	0/10.0	100 ul
aqueous method blank	--	30 ml
SR12237-1	--	5.0 ml
SR12237-2	--	5.0 ml
SR12237-2 Duplicate	--	5.0 ml
SR12237-3	--	5.0 ml
SR12237-4	--	5.0 ml
SR12237-5	--	5.0 ml
SR12237-6	--	5.0 ml
SR12237-7	--	5.0 ml
SR12237-8	4.1790/10.0	100 ul
SR12237-9	4.1044/10.0	100 ul
SR12237-10	4.0140/10.0	100 ul
SR12237-11	4.1830/10.0	100 ul
SR12237-12	4.4550/10.0	100 ul
SR12237-12 Duplicate	4.4550/10.0	100 ul

1. Preparatory Factors and Data Qualifications (CONT'D)

Preparatory Factors

AE, B/N, Pesticides and Polychlorinated Biphenyls

Sample No.	Initial Volume	Final Volume
solid method blank	--	10.0 ml
aqueous method blank	1,000 ml	10.0 ml
SR12237-1	970 ml	10.0 ml
SR12237-2	880 ml	10.0 ml
SR12237-2 Duplicate	970 ml	10.0 ml
SR12237-3	930 ml	10.0 ml
SR12237-4	910 ml	10.0 ml
SR12237-5	970 ml	10.0 ml
SR12237-6	1,000 ml	10.0 ml
SR12237-7	88 ml	10.0 ml
SR12237-8	30.73 g	10.0 ml
SR12237-9	30.18 g	10.0 ml
SR12237-10	30.28 g	10.0 ml
SR12237-10 Duplicate	30.96 g	10.0 ml
SR12237-11	30.02 g	10.0 ml
SR12237-12	30.09 g	10.0 ml

Data Qualifications

1. The minimum response factor for bromofrom in the volatiles was not met in the initial calibration curve.

2. The minimum response factor for bromoform in the volatiles was not met in the check standard.

3. The maximum percent difference not met for three of thirteen calibration check compounds on November 11, 1985 and not met for two of thirteen calibration check compounds on November 12, 1985.

4. 2,2,4-Trimethylpentane(Isooctane) is a contaminent in the methanol used for volatiles on solid samples and is reported frequently in the volatile NBS Library Search.

5. Due to the complexity of the chromatogram and the ratio of response between the original and confirmation for samples SR11327-9 (delta BHC) and SR11327-12 (Endosulfan I) there is a doubt to whether these compounds are actually present.

Reference 18 5/33

ANALYTICAL INC.

II. Methodology (CONT'D)

Pesticides and Polychlorinated Biphenyls

Aqueous and solid samples are prepared in accordance with the methods outlined under "Acid Extractables and Base/Neutral Extractable Organics." Following evaporation in the Kuderna-Danish apparatus, the extract is then solvent exchanged to hexane and eluted through a 20-gram florisil column with 50% petroleum ether in diethyl ether for cleanup.

Oil samples are prepared by adding a known amount of sample to a 20 gram florisil column, and eluting with 50% petroleum in diethyl ether. Analysis of the above extracts is carried out by GC in accordance with the following method:

- EPA Method 608, Organochlorine Pesticides and PCB's, Federal Register, Vol. 44, No. 233, December 3, 1979.

Any result reported above the MDL has been confirmed by analyses on an alternate column.

Miscellaneous Parameters

Aqueous, non-aqueous and solid samples are prepared and analyzed according to the following publications:

- EPA Test Methods for Evaluating Solid Wastes - Physical/Chemical Methods -SW846, 1982.
- Standard Methods for the Examination of Water and Wastewater, 15th edition.
- EPA Chemical Analysis of Water and Wastes, EPA-600, 1979.

III. Analytical Results

Volatile Organics

Constituent	Sample Designation: solid method blank	SR12237-1 RW1	SR12237-2 RW2	SR12237-2 Duplicate	MDL, ug/l
Chloromethane	ND	ND	ND	ND	10
Bromomethane	ND	ND	ND	ND	10
Vinyl chloride	ND	ND	ND	ND	10
Chloroethane	ND	ND	ND	ND	10
Methylene chloride*	1.2J	1.7JB	3.0JB	8.0JB	10
1,1-Dichloroethene	ND	ND	ND	ND	10
1,1-Dichloroethane	ND	ND	ND	ND	10
trans-1,2-Dichloroethene	ND	ND	ND	ND	10
Chloroform	ND	ND	ND	ND	10
1,2-Dichloroethane	ND	ND	ND	ND	10
1,1,1-Trichloroethane	ND	ND	ND	ND	10
Carbon tetrachloride	ND	ND	ND	ND	10
Bromodichloromethane	ND	ND	ND	ND	10
1,2-Dichloropropane	ND	ND	ND	ND	10
trans-1,3-Dichloropropene	ND	ND	ND	ND	10
Trichloroethene	ND	ND	ND	ND	10
Benzene	ND	ND	2.6J	2.4J	10
Dibromochloromethane	ND	ND	ND	ND	10
1,1,2-Trichloroethane	ND	ND	ND	ND	10
cis-1,3-Dichloropropene	ND	ND	ND	ND	10
2-Chloroethyl vinyl ether	ND	ND	ND	ND	10
Bromoform	ND	ND	ND	ND	10
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	10
Tetrachloroethene	ND	ND	ND	ND	10
Toluene*	ND	ND	ND	ND	10
Chlorobenzene	ND	ND	140	130	10
Ethyl benzene	ND	ND	ND	ND	10

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

J - Constituent detected but below the MDL. Quantification of level preceeding letter is approximate.

B - Analyte found in the blank as well as the sample. This warns data user of possible blank contamination.

III. Analytical Results, (CONT'D)

Volatile Organics

Constituent	Sample Designation SR12237-3 Leachate #1	SR12237-4 Leachate #2	SR12237-5 Potable #1	MDL, ug/l
Chloromethane	ND	ND	ND	10
Bromomethane	ND	ND	ND	10
Vinyl chloride	ND	ND	ND	10
Chloroethane	ND	ND	ND	10
Methylene chloride*	5.6JB	1.6JB	6.0JB	10
1,1-Dichloroethene	ND	ND	ND	10
1,1-Dichloroethane	ND	ND	ND	10
trans-1,2-Dichloroethene	ND	ND	ND	10
Chloroform	ND	ND	ND	10
1,2-Dichloroethane	ND	ND	ND	10
1,1,1-Trichloroethane	ND	ND	ND	10
Carbon tetrachloride	ND	ND	ND	10
Bromodichloromethane	ND	ND	ND	10
1,2-Dichloropropane	ND	ND	ND	10
trans-1,3-Dichloropropene	ND	ND	ND	10
Trichloroethene	ND	ND	ND	10
Benzene	ND	ND	ND	10
Dibromochloromethane	ND	ND	ND	10
1,1,2-Trichloroethane	ND	ND	ND	10
cis-1,3-Dichloropropene	ND	ND	ND	10
2-Chloroethyl vinyl ether	ND	ND	ND	10
Bromoform	ND	ND	ND	10
1,1,2,2-Tetrachloroethane	ND	ND	ND	10
Tetrachloroethene	ND	ND	ND	10
Toluene*	ND	35	ND	10
Chlorobenzene	ND	ND	ND	10
Ethyl benzene	ND	11	ND	10

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

J - Constituent detected but below the MDL. Quantification of level preceeding letter is approximate.

B - Analyte found in the blank as well as the sample. This warns data user of possible blank contamination.

Reference 18
8/33

III. Analytical Results, (CONT'D)

Volatile Organics

Constituent	Sample Designation SR12237-6 Trip Blank	SR12237-7 Field Blank	MDL, ug/l
Chloromethane	ND	ND	10
Bromomethane	ND	ND	10
Vinyl chloride	ND	ND	10
Chloroethane	ND	ND	10
Methylene chloride*	5.6JB	5.5JB	10
1,1-Dichloroethene	ND	ND	10
1,1-Dichloroethane	ND	ND	10
trans-1,2-Dichloroethene	ND	ND	10
Chloroform	ND	ND	10
1,2-Dichloroethane	ND	ND	10
1,1,1-Trichloroethane	ND	ND	10
Carbon tetrachloride	ND	ND	10
Bromodichloromethane	ND	ND	10
1,2-Dichloropropane	ND	ND	10
trans-1,3-Dichloropropene	ND	ND	10
Trichloroethene	ND	ND	10
Benzene	ND	ND	10
Dibromochloromethane	ND	ND	10
1,1,2-Trichloroethane	ND	ND	10
cis-1,3-Dichloropropene	ND	ND	10
2-Chloroethyl vinyl ether	ND	ND	10
Bromoform	ND	ND	10
1,1,2,2-Tetrachloroethane	ND	ND	10
Tetrachloroethene	ND	ND	10
Toluene*	ND	ND	10
Chlorobenzene	ND	ND	10
Ethyl benzene	ND	ND	10

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

J - Constituent detected but below the MDL. Quantification of level preceeding letter is approximate.

B - Analyte found in the blank as well as the sample. This warns data user of possible blank contamination.

ANALYTICAL INC.

III. Analytical Results, (CONT'D)

Volatile Organics

Constituent	Sample Designation: solid method blank	SR12237-8 Soil #1	SR12237-9 Soil #2	SR12237-10 Soil #3	MDL, ug/kg
Chloromethane	ND	ND	ND	ND	330
Bromomethane	ND	ND	ND	ND	330
Vinyl chloride	ND	ND	ND	ND	330
Chloroethane	ND	ND	ND	ND	330
Methylene chloride*	320J	630B	580B	1,100B	330
1,1-Dichloroethene	ND	ND	ND	ND	330
1,1-Dichloroethane	ND	ND	ND	ND	330
trans-1,2-Dichloroethene	ND	ND	ND	ND	330
Chloroform	ND	ND	ND	ND	330
1,2-Dichloroethane	ND	ND	ND	ND	330
1,1,1-Trichloroethane	ND	ND	ND	ND	330
Carbon tetrachloride	ND	ND	ND	ND	330
Bromodichloromethane	ND	ND	ND	ND	330
1,2-Dichloropropane	ND	ND	ND	ND	330
trans-1,3-Dichloropropene	ND	ND	ND	ND	330
Trichloroethene	ND	ND	ND	ND	330
Benzene	ND	ND	ND	ND	330
Dibromochloromethane	ND	ND	ND	ND	330
1,1,2-Trichloroethane	ND	ND	ND	ND	330
cis-1,3-Dichloropropene	ND	ND	ND	ND	330
2-Chloroethyl vinyl ether	ND	ND	ND	ND	330
Bromoform	ND	ND	ND	ND	330
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	330
Tetrachloroethene	ND	ND	ND	ND	330
Toluene*	ND	ND	ND	ND	330
Chlorobenzene	ND	ND	ND	ND	330
Ethyl benzene	ND	ND	ND	ND	330

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

J - Constituent detected but below the MDL. Quantification of level preceeding letter is approximate.

B - Analyte found in the blank as well as the sample. This warns data user of possible blank contamination.

III. Analytical Results, (CONT'D)

Volatile Organics

Constituent	Sample Designation SR12237-11 Soil #4	SR12237-12 Soil #5	SR12237-12 Duplicate	MDL, ug/kg
Chloromethane	ND	ND	ND	330
Bromomethane	ND	ND	ND	330
Vinyl chloride	ND	ND	ND	330
Chloroethane	ND	ND	ND	330
Methylene chloride*	950B	720B	670B	330
1,1-Dichloroethene	ND	ND	ND	330
1,1-Dichloroethane	ND	ND	ND	330
trans-1,2-Dichloroethene	ND	ND	ND	330
Chloroform	ND	ND	ND	330
1,2-Dichloroethane	ND	ND	ND	330
1,1,1-Trichloroethane	ND	ND	ND	330
Carbon tetrachloride	ND	ND	ND	330
Bromodichloromethane	ND	ND	ND	330
1,2-Dichloropropane	ND	ND	ND	330
trans-1,3-Dichloropropene	ND	ND	ND	330
Trichloroethene	ND	ND	ND	330
Benzene	ND	ND	ND	330
Dibromochloromethane	ND	ND	ND	330
1,1,2-Trichloroethane	ND	ND	ND	330
cis-1,3-Dichloropropene	ND	ND	ND	330
2-Chloroethyl vinyl ether	ND	ND	ND	330
Bromoform	ND	ND	ND	330
1,1,2,2-Tetrachloroethane	ND	ND	ND	330
Tetrachloroethene	ND	ND	ND	330
Toluene*	ND	ND	ND	330
Chlorobenzene	ND	ND	ND	330
Ethyl benzene	ND	ND	ND	330

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

B - Analyte found in the blank as well as the sample. This warns data user of possible blank contamination.

Reference 18
11/33

III. Analytical Results, (CONT'D)

Acid Extractable Organics (Method 625 by GC/MS)

Constituent	Sample Designation: aqueous method blank	SR12237-1 RW1	SR12237-2 RW2	SR12237-2 Duplicate	MDL, ug/l
Phenol	ND	ND	ND	ND	5.0
2-Chlorophenol	ND	ND	ND	ND	5.0
2-Nitrophenol	ND	ND	ND	ND	5.0
2,4-Dimethylphenol	ND	ND	ND	ND	5.0
2,4-Dichlorophenol	ND	ND	ND	ND	5.0
4-Chloro-3-methyl-phenol	ND	ND	ND	ND	5.0
2,4,6-Trichlorophenol	ND	ND	ND	ND	5.0
2,4-Dinitrophenol	ND	ND	ND	ND	50
4-Nitrophenol	ND	ND	ND	ND	5.0
2-Methyl-4,6-dinitrophenol	ND	ND	ND	ND	50
Pentachlorophenol	ND	ND	ND	ND	5.0

Constituent	Sample Designation: SR12237-3 Leachate #1	SR12237-4 Leachate #2	SR12237-5 Potable #1	MDL, ug/l
Phenol	ND	ND	ND	5.0
2-Chlorophenol	ND	ND	ND	5.0
2-Nitrophenol	ND	ND	ND	5.0
2,4-Dimethylphenol	ND	ND	ND	5.0
2,4-Dichlorophenol	ND	ND	ND	5.0
4-Chloro-3-methyl-phenol	ND	ND	ND	5.0
2,4,6-Trichlorophenol	ND	ND	ND	5.0
2,4-Dinitrophenol	ND	ND	ND	50
4-Nitrophenol	ND	ND	ND	5.0
2-Methyl-4,6-dinitrophenol	ND	ND	ND	50
Pentachlorophenol	ND	ND	ND	5.0

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

III. Analytical Results, (CONT'D)

Acid Extractable Organics (Method 625 by GC/MS)

Constituent	Sample Designation SR12237-6 Trip Blank	SR12237-7 Field Blank	MDL, ug/l
Phenol	ND	ND	5.0
2-Chlorophenol	ND	ND	5.0
2-Nitrophenol	ND	ND	5.0
2,4-Dimethylphenol	ND	ND	5.0
2,4-Dichlorophenol	ND	ND	5.0
4-Chloro-3-methyl-phenol	ND	ND	5.0
2,4,6-Trichlorophenol	ND	ND	5.0
2,4-Dinitrophenol	ND	ND	50
4-Nitrophenol	ND	ND	5.0
2-Methyl-4,6-dinitrophenol	ND	ND	50
Pentachlorophenol	ND	ND	5.0

Constituent	Sample Designation solid method blank	SR12237-8 Soil #1	SR12237-9 Soil #2	SR12237-10 Soil #3
Phenol	ND	ND	ND	ND
2-Chlorophenol	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND
4-Chloro-3-methyl-phenol	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND
2-Methyl-4,6-dinitrophenol	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

III. Analytical Results, (CONT'D)

Acid Extractable Organics (Method 625 by GC/MS)

Constituent	Sample Designation SR12237-10 Duplicate	SR12237-11 Soil #4	SR12237-12 Soil #5	MDL, ug/kg
Phenol	ND	ND	ND	830
2-Chlorophenol	ND	ND	ND	830
2-Nitrophenol	ND	ND	ND	830
2,4-Dimethylphenol	ND	ND	ND	830
2,4-Dichlorophenol	ND	ND	ND	830
4-Chloro-3-methyl-phenol	ND	ND	ND	830
2,4,6-Trichlorophenol	ND	ND	ND	830
2,4-Dinitrophenol	ND	ND	ND	8,300
4-Nitrophenol	ND	ND	ND	830
2-Methyl-4,6-dinitrophenol	ND	ND	ND	8,300
Pentachlorophenol	ND	ND	ND	830

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

Reference 18

14/33

Analytical Results, CONT'D)

Base/Neutral Extractable Organics (Method 625 by GC/MS)

Constituent	aqueous method blank	Sample Designation SR12237-1 RW1	SR12237-2 RW2	SR12237-2 Duplicate	MDL, ug/l
bis(2-Chloroethyl) ether	ND	ND	ND	ND	1.0
1,2-Dichlorobenzene	ND	ND	ND	ND	1.0
1,4-Dichlorobenzene	ND	ND	ND	ND	1.0
1,3-Dichlorobenzene	ND	ND	ND	ND	1.0
bis (2-Chloroisopropyl) ether	ND	ND	ND	ND	1.0
N-Nitrosodipropyl amine	ND	ND	ND	ND	1.0
Hexachloroethane	ND	ND	ND	ND	1.0
Nitrobenzene	ND	ND	ND	ND	1.0
Isophorone	ND	ND	ND	ND	1.0
bis (2-Chloroethoxy) methane	ND	ND	ND	ND	1.0
1,2,4-Trichlorobenzene	ND	ND	ND	ND	1.0
Naphthalene	ND	ND	ND	ND	1.0
Hexachlorobutadiene	ND	ND	ND	ND	1.0
Hexachlorocyclopentadiene	ND	ND	ND	ND	1.0
2-Chloronaphthalene	ND	ND	ND	ND	1.0
Dimethyl phthalate*	ND	ND	ND	ND	1.0
2,6-Dinitrotoluene	ND	ND	ND	ND	1.0
Acenaphthylene	ND	ND	ND	ND	1.0
Acenaphthene	ND	ND	ND	ND	1.0
2,4-Dinitrotoluene	ND	ND	ND	ND	1.0
Diethyl phthalate*	ND	ND	ND	ND	1.0
N-Nitrosodimethyl amine	ND	ND	ND	ND	1.0
4-Chlorophenylphenyl ether	ND	ND	ND	ND	1.0
Fluorene	ND	ND	ND	ND	1.0
Azobenzene	ND	ND	ND	ND	1.0
N-Nitrosodiphenyl amine	ND	ND	ND	ND	1.0
4-Bromophenylphenyl ether	ND	ND	ND	ND	1.0
Hexachlorobenzene	ND	ND	ND	ND	1.0
Phenanthrene	ND	ND	ND	ND	1.0
Anthracene	ND	ND	ND	ND	1.0
Dibutyl phthalate*	ND	ND	ND	ND	1.0
Fluoranthene	ND	ND	ND	ND	1.0
Benzidine	ND	ND	ND	ND	30
Pyrene	ND	ND	ND	ND	1.0
Butylbenzyl phthalate*	ND	ND	ND	ND	1.0
3,3'-Dichlorobenzidine	ND	ND	ND	ND	30
Benzo (a) anthracene	ND	ND	ND	ND	1.0
Chrysene	ND	ND	ND	ND	1.0
bis (2-Ethylhexyl) phthalate*	ND	ND	ND	ND	1.0
Dioctyl phthalate*	ND	ND	ND	ND	1.0
Benzo (k) fluoranthene	ND	ND	ND	ND	1.0
Benzo (b) fluoranthene	ND	ND	ND	ND	1.0
Benzo (a) pyrene	ND	ND	ND	ND	1.0
Indeno (1,2,3-c,d) pyrene	ND	ND	ND	ND	20
Dibenzo (a,h) anthracene	ND	ND	ND	ND	20
Benzo (ghi) perylene	ND	ND	ND	ND	20

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

Reference 18
15/33

ANALYTICAL RESULTS (CONT'D)

Base/Neutral Extractable Organics (Method 625 by GC/MS)

Constituent	Sample Designation SR12237-3 Leachate #1	SR12237-4 Leachate #2	SR12237-5 Potable #1	MDL, ug/l
bis(2-Chloroethyl) ether	ND	ND	ND	1.0
1,2-Dichlorobenzene	ND	ND	ND	1.0
1,4-Dichlorobenzene	ND	ND	ND	1.0
1,3-Dichlorobenzene	ND	ND	ND	1.0
bis (2-Chloroisopropyl) ether	ND	ND	ND	1.0
N-Nitrosodipropyl amine	ND	ND	ND	1.0
Hexachloroethane	ND	ND	ND	1.0
Nitrobenzene	ND	ND	ND	1.0
Isophorone	ND	ND	ND	1.0
bis (2-Chloroethoxy) methane	ND	ND	ND	1.0
1,2,4-Trichlorobenzene	ND	ND	ND	1.0
Naphthalene	ND	ND	ND	1.0
Hexachlorobutadiene	ND	ND	ND	1.0
Hexachlorocyclopentadiene	ND	ND	ND	1.0
2-Chloronaphthalene	ND	ND	ND	1.0
Dimethyl phthalate*	ND	ND	ND	1.0
2,6-Dinitrotoluene	ND	ND	ND	1.0
Acenaphthylene	ND	ND	ND	1.0
Acenaphthene	ND	ND	ND	1.0
2,4-Dinitrotoluene	ND	40	ND	1.0
Diethyl phthalate*	ND	ND	ND	1.0
N-Nitrosodimethyl amine	ND	ND	ND	1.0
4-Chlorophenylphenyl ether	ND	ND	ND	1.0
Fluorene	ND	ND	ND	1.0
Azobenzene	ND	ND	ND	1.0
N-Nitrosodiphenyl amine	ND	ND	ND	1.0
4-Bromophenylphenyl ether	ND	ND	ND	1.0
Hexachlorobenzene	ND	ND	ND	1.0
Phenanthrene	ND	ND	ND	1.0
Anthracene	ND	ND	ND	1.0
Dibutyl phthalate*	ND	ND	ND	1.0
Fluoranthene	ND	ND	ND	30
Benzidine	ND	ND	ND	1.0
Pyrene	ND	ND	ND	1.0
Butylbenzyl phthalate*	ND	ND	ND	30
3,3'-Dichlorobenzidine	ND	ND	ND	1.0
Benzo (a) anthracene	ND	ND	ND	1.0
Chrysene	ND	ND	ND	1.0
bis (2-Ethylhexyl) phthalate*	35	39	ND	1.0
Dioctyl phthalate*	ND	ND	ND	1.0
Benzo (k) fluoranthene	ND	ND	ND	1.0
Benzo (b) fluoranthene	ND	ND	ND	1.0
Benzo (a) pyrene	ND	ND	ND	20
Indeno (1,2,3-c,d) pyrene	ND	ND	ND	20
Dibenzo (a,h) anthracene	ND	ND	ND	20
Benzo (ghi) perylene	ND	ND	ND	20

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND -- Not Detected
MDL - Method Detection Limit (lowest possible limit at which compound can be quantified)

Reference 18
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ANALYTICAL RESULTS (CONT'D)

Base/Neutral Extractable Organics (Method 625 by GC/MS)

Constituent	Sample Designation SR12237-6 Trip Blank	SR12237-7 Field Blank	MDL, ug/l
bis(2-Chloroethyl) ether	ND	ND	1.0
1,2-Dichlorobenzene	ND	ND	1.0
1,4-Dichlorobenzene	ND	ND	1.0
1,3-Dichlorobenzene	ND	ND	1.0
bis (2-Chloroisopropyl) ether	ND	ND	1.0
N-Nitrosodipropyl amine	ND	ND	1.0
Hexachloroethane	ND	ND	1.0
Nitrobenzene	ND	ND	1.0
Isophorone	ND	ND	1.0
bis (2-Chloroethoxy) methane	ND	ND	1.0
1,2,4-Trichlorobenzene	ND	ND	1.0
Naphthalene	ND	ND	1.0
Hexachlorobutadiene	ND	ND	1.0
Hexachlorocyclopentadiene	ND	ND	1.0
2-Chloronaphthalene	ND	ND	1.0
Dimethyl phthalate*	ND	ND	1.0
2,6-Dinitrotoluene	ND	ND	1.0
Acenaphthylene	ND	ND	1.0
Acenaphthene	ND	ND	1.0
2,4-Dinitrotoluene	ND	ND	1.0
Diethyl phthalate*	ND	ND	1.0
N-Nitrosodimethyl amine	ND	ND	1.0
4-Chlorophenylphenyl ether	ND	ND	1.0
Fluorene	ND	ND	1.0
Azobenzene	ND	ND	1.0
N-Nitrosodiphenyl amine	ND	ND	1.0
4-Bromophenylphenyl ether	ND	ND	1.0
Hexachlorobenzene	ND	ND	1.0
Phenanthrene	ND	ND	1.0
Anthracene	ND	ND	1.0
Dibutyl phthalate*	ND	ND	1.0
Fluoranthene	ND	ND	1.0
Benzidine	ND	ND	30
Pyrene	ND	ND	1.0
Butylbenzyl phthalate*	ND	ND	1.0
3,3'-Dichlorobenzidine	ND	ND	30
Benzo (a) anthracene	ND	ND	1.0
Chrysene	ND	ND	1.0
bis (2-Ethylhexyl) phthalate*	ND	ND	1.0
Dioctyl phthalate*	ND	ND	1.0
Benzo (k) fluoranthene	ND	ND	1.0
Benzo (b) fluoranthene	ND	ND	1.0
Benzo (a) pyrene	ND	ND	1.0
Indeno (1,2,3-c,d) pyrene	ND	ND	20
Dibenzo (a,h) anthracene	ND	ND	20
Benzo (ghi) perylene	ND	ND	20

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected
MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

Reference 18
17/33

ANALYTICAL (CONT'D)

Base/Neutral Extractable Organics (Method 625 by GC/MS)

Constituent	Sample Designation SR12237-8 Soil #1	SR12237-9 Soil #2	SR12237-10 Soil #3	MDL, ug/kg
bis(2-Chloroethyl) ether	ND	ND	ND	330
1,2-Dichlorobenzene	ND	ND	ND	330
1,4-Dichlorobenzene	ND	ND	ND	330
1,3-Dichlorobenzene	ND	ND	ND	330
bis (2-Chloroisopropyl) ether	ND	ND	ND	330
N-Nitrosodipropyl amine	ND	ND	ND	330
Hexachloroethane	ND	ND	ND	330
Nitrobenzene	ND	ND	ND	330
Isophorone	ND	ND	ND	330
bis (2-Chloroethoxy) methane	ND	ND	ND	330
1,2,4-Trichlorobenzene	ND	ND	ND	330
Naphthalene	ND	ND	ND	330
Hexachlorobutadiene	ND	ND	ND	330
Hexachlorocyclopentadiene	ND	ND	ND	330
2-Chloronaphthalene	ND	ND	ND	330
Dimethyl phthalate*	ND	ND	ND	330
2,6-Dinitrotoluene	ND	ND	ND	330
Acenaphthylene	ND	ND	ND	330
Acenaphthene	ND	ND	ND	330
2,4-Dinitrotoluene	ND	ND	ND	330
Diethyl phthalate*	ND	ND	ND	330
N-Nitrosodimethyl amine	ND	ND	ND	330
4-Chlorophenylphenyl ether	ND	ND	ND	330
Fluorene	ND	ND	ND	330
Azobenzene	ND	ND	ND	330
N-Nitrosodiphenyl amine	ND	ND	ND	330
4-Bromophenylphenyl ether	ND	ND	ND	330
Hexachlorobenzene	ND	ND	ND	330
Phenanthrene	ND	ND	ND	330
Anthracene	ND	ND	ND	330
Dibutyl phthalate*	ND	ND	ND	330
Fluoranthene	ND	ND	ND	330
Benzidine	ND	ND	ND	9,900
Pyrene	ND	ND	ND	330
Butylbenzyl phthalate*	ND	ND	ND	330
3,3'-Dichlorobenzidine	ND	ND	ND	9,900
Benzo (a) anthracene	ND	ND	ND	330
Chrysene	ND	ND	ND	330
bis (2-Ethylhexyl) phthalate*	ND	72J	ND	330
Dioctyl phthalate*	ND	ND	ND	330
Benzo (k) fluoranthene	ND	ND	ND	330
Benzo (b) fluoranthene	ND	ND	ND	330
Benzo (a) pyrene	ND	ND	ND	330
Indeno (1,2,3-c,d) pyrene	ND	ND	ND	6,600
Dibenzo (a,h) anthracene	ND	ND	ND	6,600
Benzo (ghi) perylene	ND	ND	ND	6,600

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

J - Constituent detected but below the MDL. Quantification of level

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ANALYTICAL RESULTS (CONT'D)

Base/Neutral Extractable Organics (Method 625 by GC/MS)

Constituent	Sample Designation SR12237-10 Duplicate	SR12237-11 Soil #4	SR12237-12 Soil #5	MDL, ug/kg
bis(2-Chloroethyl) ether	ND	ND	ND	330
1,2-Dichlorobenzene	ND	ND	ND	330
1,4-Dichlorobenzene	ND	ND	ND	330
1,3-Dichlorobenzene	ND	ND	ND	330
bis (2-Chloroisopropyl) ether	ND	ND	ND	330
N-Nitrosodipropyl amine	ND	ND	ND	330
Hexachloroethane	ND	ND	ND	330
Nitrobenzene	ND	ND	ND	330
Isophorone	ND	ND	ND	330
bis (2-Chloroethoxy) methane	ND	ND	ND	330
1,2,4-Trichlorobenzene	ND	ND	ND	330
Naphthalene	ND	ND	ND	330
Hexachlorobutadiene	ND	ND	ND	330
Hexachlorocyclopentadiene	ND	ND	ND	330
2-Chloronaphthalene	ND	ND	ND	330
Dimethyl phthalate*	ND	ND	ND	330
2,6-Dinitrotoluene	ND	ND	ND	330
Acenaphthylene	ND	ND	ND	330
Acenaphthene	ND	ND	ND	330
2,4-Dinitrotoluene	ND	ND	ND	330
Diethyl phthalate*	ND	110J	430	330
N-Nitrosodimethyl amine	ND	ND	ND	330
4-Chlorophenylphenyl ether	ND	ND	ND	330
Fluorene	ND	ND	ND	330
Azobenzene	ND	ND	ND	330
N-Nitrosodiphenyl amine	ND	ND	ND	330
4-Bromophenylphenyl ether	ND	ND	ND	330
Hexachlorobenzene	ND	ND	ND	330
Phenanthrene	ND	ND	ND	330
Anthracene	ND	ND	ND	330
Dibutyl phthalate*	ND	ND	ND	330
Fluoranthene	ND	ND	ND	330
Benzidine	ND	ND	ND	9,900
Pyrene	ND	ND	ND	330
Butylbenzyl phthalate*	ND	ND	1,700	330
3,3'-Dichlorobenzidine	ND	ND	ND	9,900
Benzo (a) anthracene	ND	ND	ND	330
Chrysene	ND	ND	ND	330
bis (2-Ethylhexyl) phthalate*	ND	ND	ND	330
Dioctyl phthalate*	ND	ND	1,600	330
Benzo (k) fluoranthene	ND	ND	1,000	330
Benzo (b) fluoranthene	ND	ND	ND	330
Benzo (a) pyrene	ND	ND	ND	330
Indeno (1,2,3-c,d) pyrene	ND	ND	ND	6,600
Dibenzo (a,h) anthracene	ND	ND	ND	6,600
Benzo (ghi) perylene	ND	ND	ND	6,600

*Identification of these compounds at low levels is sometimes attributed to laboratory contamination.

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

J - Constituent detected but below the MDL. Quantification of level

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ANALYTICAL INC.

III. Analytical Results, (CONT'D)

Pesticidal Compounds and Polychlorinated Biphenyls

Constituent	Sample Designation: aqueous method blank	SR12237-1 RW1	SR12237-2 RW2	SR12237-2 Duplicate	MDL, ug/l
Aldrin	ND	ND	ND	ND	1.0
alpha BHC	ND	ND	ND	ND	1.0
beta BHC	ND	ND	ND	ND	1.0
gamma BHC	ND	ND	ND	ND	1.0
delta BHC	ND	ND	ND	ND	1.0
Chlordane	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	1.0
p,p'-DDE	ND	ND	ND	ND	1.0
p,p'-DDT	ND	ND	ND	ND	1.0
p,p'-DDD	ND	ND	ND	ND	1.0
Endosulfan I	ND	ND	ND	ND	1.0
Endosulfan II	ND	ND	ND	ND	1.0
Endosulfan Sulfate	ND	ND	ND	ND	1.0
Endrin	ND	ND	ND	ND	1.0
Endrin Aldehyde	ND	ND	ND	ND	1.0
Heptachlor	ND	ND	ND	ND	1.0
Heptachlor Epoxide	ND	ND	ND	ND	1.0
Toxaphene	ND	ND	ND	ND	4.0
Polychlorinated Biphenyls, total, as Aroclor 1254	ND	ND	ND	ND	1.0

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

ANALYTICAL INC.

III. Analytical Results, (CONT'D)

Pesticidal Compounds and Polychlorinated Biphenyls

Constituent	Sample Designation SR12237-3 Leachate #1	SR12237-4 Leachate #2	SR12237-5 Potable #1	MDL, ug/l
Aldrin	ND	ND	ND	1.0
alpha BHC	ND	ND	ND	1.0
beta BHC	ND	ND	ND	1.0
gamma BHC	ND	ND	ND	1.0
delta BHC	ND	ND	ND	1.0
Chlordane	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	1.0
p,p'-DDE	ND	ND	ND	1.0
p,p'-DDT	ND	ND	ND	1.0
p,p'-DDD	ND	ND	ND	1.0
Endosulfan I	ND	ND	ND	1.0
Endosulfan II	ND	ND	ND	1.0
Endosulfan Sulfate	ND	ND	ND	1.0
Endrin	ND	ND	ND	1.0
Endrin Aldehyde	ND	ND	ND	1.0
Heptachlor	ND	ND	ND	1.0
Heptachlor Epoxide	ND	ND	ND	1.0
Toxaphene	ND	ND	ND	4.0
Polychlorinated Biphenyls, total, as Aroclor 1254	ND	ND	ND	1.0

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

ANALYTICAL INC.

III. Analytical Results, (CONT'D)

Pesticidal Compounds and Polychlorinated Biphenyls

Constituent	Sample Designation SR12237-6 Trip Blank	SR12237-7 Field Blank	MDL, ug/l
Aldrin	ND	ND	1.0
alpha BHC	ND	ND	1.0
beta BHC	ND	ND	1.0
gamma BHC	ND	ND	1.0
delta BHC	ND	ND	1.0
Chlordane	ND	ND	1.0
Dieldrin	ND	ND	1.0
p,p'-DDE	ND	ND	1.0
p,p'-DDT	ND	ND	1.0
p,p'-DDD	ND	ND	1.0
Endosulfan I	ND	ND	1.0
Endosulfan II	ND	ND	1.0
Endosulfan Sulfate	ND	ND	1.0
Endrin	ND	ND	1.0
Endrin Aldehyde	ND	ND	1.0
Heptachlor	ND	ND	1.0
Heptachlor Epoxide	ND	ND	1.0
Toxaphene	ND	ND	4.0
Polychlorinated Biphenyls, total, as Aroclor 1254	ND	ND	1.0

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

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ANALYTICAL INC.

III. Analytical Results, (CONT'D)

Pesticidal Compounds and Polychlorinated Biphenyls

Constituent	Sample Designation: solid method blank	SR12237-8 Soil #1	SR12237-8 Duplicate	SR12237-9 Soil #2	MDL, ug/kg
Aldrin	ND	ND	ND	ND	100
alpha BHC	ND	ND	ND	ND	100
beta BHC	ND	ND	ND	ND	100
gamma BHC	ND	ND	ND	ND	100
delta BHC	ND	ND	ND	96J; 400*	100
Chlordane	ND	ND	ND	ND	100
Dieldrin	ND	ND	ND	ND	100
p,p'-DDE	ND	ND	ND	ND	100
p,p'-DDT	ND	ND	ND	ND	100
p,p'-DDD	ND	ND	ND	ND	100
Endosulfan I	ND	ND	ND	ND	100
Endosulfan II	ND	ND	ND	ND	100
Endosulfan Sulfate	ND	ND	ND	ND	100
Endrin	ND	ND	ND	ND	100
Endrin Aldehyde	ND	ND	ND	ND	100
Heptachlor	ND	ND	ND	ND	100
Heptachlor Epoxide	ND	ND	ND	ND	100
Toxaphene	ND	ND	ND	ND	400
Polychlorinated Biphenyls, total, as Aroclor 1254	ND	ND	ND	ND	100

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

*Alternate column confirmation

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ANALYTICAL INC.

III. Analytical Results, (CONT'D)

Pesticidal Compounds and Polychlorinated Biphenyls

Constituent	Sample Designation SR12237-10 Soil #3	SR12237-11 Soil #4	SR12237-12 Soil #5	MDL, ug/kg
Aldrin	ND	ND	ND	100
alpha BHC	ND	ND	ND	100
beta BHC	ND	ND	ND	100
gamma BHC	ND	ND	ND	100
delta BHC	ND	ND	ND	100
Chlordane	ND	ND	ND	100
Dieldrin	ND	ND	ND	100
p,p'-DDE	ND	ND	ND	100
p,p'-DDT	ND	ND	ND	100
p,p'-DDD	ND	ND	ND	100
Endosulfan I	ND	ND	230; 100*	100
Endosulfan II	ND	ND	ND	100
Endosulfan Sulfate	ND	ND	ND	100
Endrin	ND	ND	ND	100
Endrin Aldehyde	ND	ND	ND	100
Heptachlor	ND	ND	ND	100
Heptachlor Epoxide	ND	ND	ND	100
Toxaphene	ND	ND	ND	400
Polychlorinated Biphenyls, total, as Aroclor 1254	ND	ND	ND	100

ND - Not Detected

MDL - Method Detection Limit (lowest possible limit at which compound can be accurately quantified)

*Alternate column confirmation

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M E M O R A N D U M

TO: AL PLEVA, TECHNICAL COORDINATOR

THROUGH: NANCY SPENCE, ACTING QUALITY ASSURANCE CORRDINATOR, DIVISION OF WASTE MANAGEMENT

FROM: JOHN HUNTER, OFFICE OF QUALITY ASSURANCE

SUBJECT: QUALITY ASSURANCE REVIEW OF LAKEWOOD DATA DONE BY S-R ANALYTICAL, SAMPLE NUMBERS SR12237-1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, AND -12.

The Office of Quality Assurance, Division of Waste Management, has reviewed the above referenced data package according to the NJDEP Tier I Deliverables requirements. Samples were analysed for base neutral extractable organics, acid extractable organics, volatile organics, pesitcides, PCBs, and inorganic compounds. These data are accepted. Samples SR12237-1, SR12237-2, and SR12237-5 were examined as representative of the sample set. The tunes, initial calibrations, continuing calibrations, amd holding times were found to be acceptable with the exception of the initial volatiles calibration of 11/11/85 which was illegible. The nontargeted summaries are acceptable, however several small peaks in sample SR12237-1 were not addressed in the nontargeted summary. Finally, the metals were found to be acceptable and the PCB pesticide analysis had too few deliverables provided for a quality assurance review to be performed.

Payment is recommended as the requirements of Contract X-029 have been met.

If you have any questions please feel free to contact this office at (3) 2360.

c Dr. Merry L. Morris
Paul Zarrilo

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REF-17

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
HAZARDOUS SITE MITIGATION ADMINISTRATION
CN 028, Trenton, N.J. 08625

19 NOV 1985

ARWAN M. SADAT, P.E.
DIRECTOR

JORGE H. BERKOWITZ, PH.D.
ADMINISTRATOR

MEMORANDUM

TO: STEVE BORGIANINI, ACTING BUREAU CHIEF
BUREAU OF ENVIRONMENTAL MEASUREMENTS & SITE ASSESSMENT

THROUGH: ROBERT KUNZE, ACTING ASSISTANT CHIEF
BUREAU OF ENVIRONMENTAL MEASUREMENTS & SITE ASSESSMENT AK

FROM: RICHARD GERVASIO, SUP. ENVIRONMENTAL TECH. RMG
BUREAU OF ENVIRONMENTAL MEASUREMENTS & SITE ASSESSMENT

SUBJECT: SAMPLING EPISODE LAKEWOOD LANDFILL
LAKEHURST TOWNSHIP, OCEAN COUNTY, OCTOBER 17, 1985

PURPOSE: To complete the site inspection phase of the CERCLA 104 Program for this site.

COMMENTS: Scheduled for this date (October 17, 1985) were two (2) monitoring wells on site and one (1) potable well off site (Weedhopper Flight Center). Also two flowing leachate seeps were sampled.

Five (5) soil samples were taken, four (4) 0"-6" deep and one (1) 4'-6' deep. See attached map for all sample locations.

SR Analytical provided the sampling team with one (1) trip and one (1) field blank.

SAMPLING TEAMS:

R. Gervasio	BEMSA	H. Kornitas	BEMSA
R. Hayton	BEMSA	G. Tomasini	DWR
K. Kloo	BEMSA		

WEATHER CONDITIONS:

65° Sunny

METHODOLOGY:

Lab clean dedicated trowels and teflon bailers were used to obtain samples. Monitoring wells were purged of three (3) volumes of standing water, using centrifugal pump. Respirators were worn by persons taking sample.

SAMPLE LOG:

0830 Crew on site and in protective clothing (yellow tyvex and booties, surgical gloves and nitrite gloves.)

0910 Seals broken on coolers and sample bottles inspected.

Cooler SR30, Seal 0992A, contains field blank and trip blank. No damage.

Cooler SR7, Seal 0998A, contains field blank water. No damage

Cooler SR17, Seal 0997A, contain bottles for 3 sets of aqueous samples. No damage.

Cooler SR31, Seal 0995A, contains bottles for 2 aqueous and 5 soild samples. No damage.

0922 Gervasio, Hayton, Kloo complete field blank.

0935 Gervasio and Kloo go do well samples. Kornitas, Hayton, Tomasini do soil samples.

0955 Soil sample #1 taken.

1000 Well RW-1 sampled.

1010 Leachate #1 taken.

1027 Kornitas and Hayton leave to take off site well sample #6. (Tomasini also).

1039 Tap at off site well turned on (Weedhopper Flight Center).

1042 Well RW-2 sampled. Weedhopper well 55 ft. deep.

1107 Kornitas, Hayton and Tomasini back on site.

1115 Soil #2 taken.

1131 Soil #3 taken.

1150 Soil #4 taken.
Auger used not lab cleaned.

1215 Soil #5 taken.
Augered approx. 5 ft. but decided to take sample at 1.5 ft. Dug hole adjacent to first hole.

1232 Leachate #2 taken.

CONCLUSIONS:

All shuttles and samples contained proper preservatives and were taken in a scientific manner in accordance with procedures set forth in the NJDEP/DWM field sampling manual. The chain of custody was preserved and shuttles were picked up by SR Analytical driver.

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RECOMMENDATIONS:

Await sample results.

HS76:ec
cc: Al Pleva

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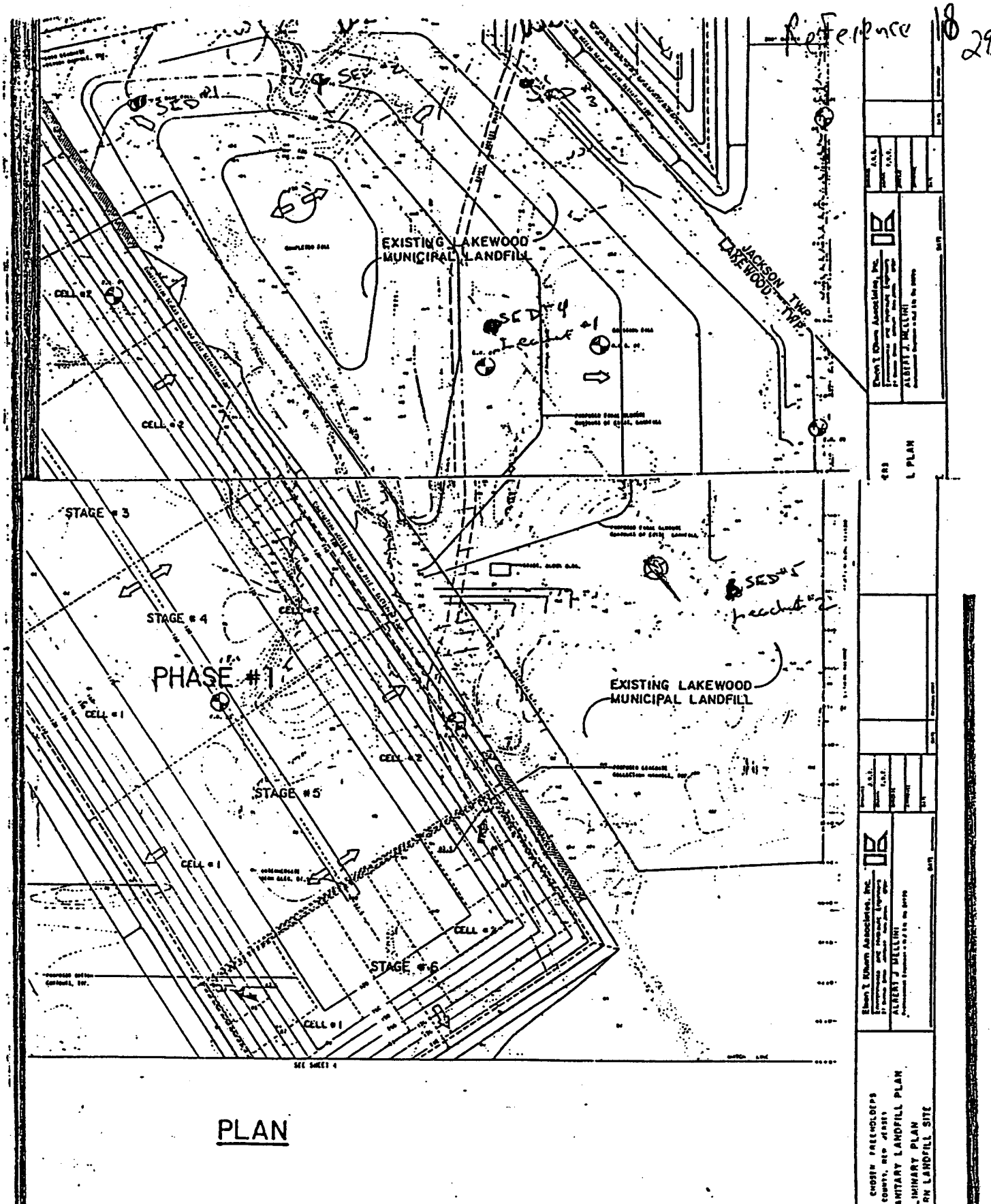

PLAN

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State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WASTE MANAGEMENT

HAZARDOUS SITE MITIGATION ADMINISTRATION

CN 028, Trenton, N.J. 08625

MARWAN M. SADAT, P.E.
DIRECTOR

21 NOV 1985

JORGE H. BERKOWITZ, PH.D.
ADMINISTRATOR

M E M O R A N D U M

TO: DR. JORGE H. BERKOWITZ, ADMINISTRATOR
HAZARDOUS SITE MITIGATION ADMINISTRATION

THROUGH: STEPHEN BORGIANINI, ACTING BUREAU CHIEF
ENVIRONMENTAL MEASUREMENTS SECTION

THROUGH: ROBERT KUNZE, ACTING ASSISTANT BUREAU CHIEF
SITE EVALUATION UNIT

FROM: ROBERT HAYTON, HSMS III
SITE EVALUATION UNIT

SUBJECT: LAKEWOOD LANDFILL

On October 17, 1985 a site inspection was performed by the Site Evaluation Unit at Lakewood Sanitary Landfill. During the course of the inspection several observations were made concerning the status of the landfill.

1) The landfill is still being used by the township for the disposal of construction debris (i.e. cement, asphalt, soil, etc.) even though the landfill was officially closed in March 1985. This activity required the removal of the access road barriers put in place when the landfill closed. The resultant easy access to the landfill has resulted in open dumping along the perimeter road around the landfill.

2) There are many leachate seeps around the landfill, many of which are flowing into low areas creating large puddles.

3) In many areas surface water runoff has eroded the sides of the landfill to the point where garbage is being exposed.

The landfill has received a preliminary HRS of 41.60 and may be included in NPL Update #7. The score may increase when results from the October 17, 1985 sampling episode are received.

HS69:ec

cc: J. Rogalski
Dr. John Trella
Al Montague
Central File

Reference 18 3/1/33

Sampling Logbook Oct 13 1985 (REF-1C)

SR 3 Soil 0995A taken by R. Gervasio (Sample bottle)

0902

Field blank done by R. Hayton & Gervasio & K Kloo

0905

Gervasio & K. Kloo go to do water samples

Kuruvas, R Hayton & G Tomosini go to do soil samples.

Soil Sample # 1 taken

Test well (RW-1) sampled

Leachate sample # 1 taken

Kuruvas & R Hayton leave to take off site well sample

Tennessee goes to help w/

Reference 18 32/33

[redacted]

[redacted]osite well samples.

[redacted]ater for off site sample
[redacted]owed on.
RW-2 Sampled

Off site sample taken
[redacted]nto. = Kaye well Drilling
dug well
55 ft. deep
[redacted]ed by Mr Vitolis

[redacted] Konwitas & Hs to check
[redacted]site

[redacted]l #2 is taken

[redacted]l # 3 is taken

Soil #4 is taken
[redacted] that was used for
[redacted]ing was not to be removed

Reference 18 33/33

had some paint on it (≈2 ft) deep

1315

Soil #5 taken

~~Auger approx~~

Augered approx 5 ft but could not take sample at ½ ft. Aug hole ~~directly~~ right next to first hole.

1232

Leachate #2 sampled

REFERENCE NO. 19

11046/2-91

RECORD OF TELEPHONE CONVERSATION

Reference 19 111.

DATE 4-24-95

TO United States Geological Survey
NAME/FILE NO.

FROM Foster Wheeler Environmental Corporation

CLIENT/PROJECT Lakewood Township Landfill

SUBJECT Flow rate of the Toms River

CHARGE: DEPT. NO._____ CLIENT SYMBOL _____ OFS NO._____

DISCUSSION WITH Ward Hickman (1-609-771-3956)

Ward stated that there was a partial station located on the Toms River near Whitesville. The partial station estimated a volumetric flow rate of 77 ft^3/s. There is no flow data available for Grunn Hollow Brook; however it appears approximately the same size on the topographical map.

BY Joseph R. Gray
NAME

Asst. Engineer
TITLE

DEPT. NO.

CC: